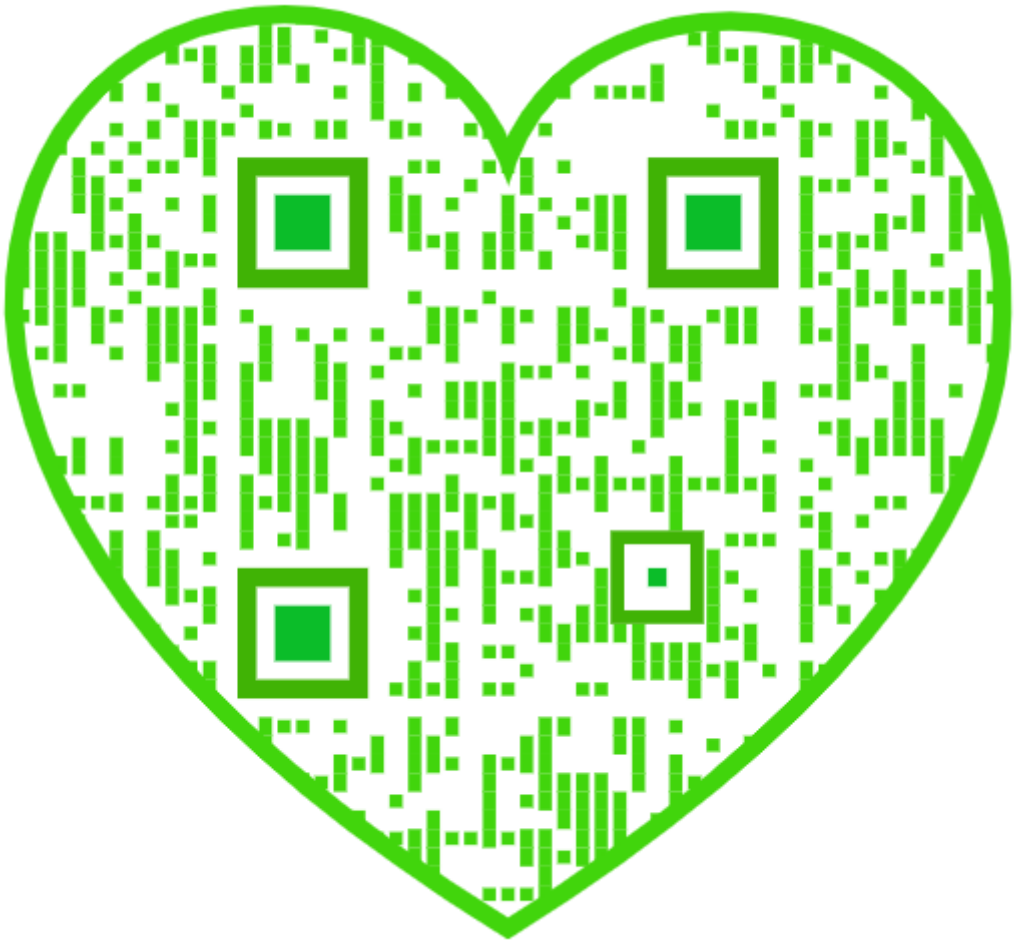

HAND-BOOK

OF

OBSTETRICS

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BY

R. CADWALLADER, A.M., M.D.

Assistant in Obstetrics University of California, Medical Department, San Francisco, Calif.

With 104 Illustrations in the Text

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"Cui dono lepidus novum libellum
Arido modo pumice expolitum ?"
(*CATULLUS.*)

THIS VOLUME, THEN, IS DEDICATED TO ONE WHO FOR YEARS HAS BEEN A STIMULUS AND A SOURCE OF INSPIRATION.

PREFACE.

It is with exceeding diffidence that I have had the temerity to venture into the field of authorship. The subject of obstetrics has been very fully covered by such writers as Webster, Williams, Hirst, Edgar and others, who have written the results of their original researches. My apology is that because their work is largely original, it is of necessity prolix, and any single book contains much matter that unfits it for student use.

I have endeavored to eliminate all possible extraneous matter and condense into a small volume the essential facts of obstetrics; at the same time I have not entirely resisted the temptation to give my personal opinions and experience. I have not credited these outside sources in detail, believing that all that has been published is now the common property of the craft.

The manuscript was just ready for the printer when the disaster of April 18, 1906, occurred. By an accident it was saved, while all the notes and data from which it was compiled were burned with my office. The subsequent changes and six months spent in Europe have delayed its publication and have given me the opportunity to revise the work in a manner that only personal observation in the large centers could afford.

R. Cadwallader.

1425 Haight Street,
San Francisco, Cal.

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HAND-BOOK OF OBSTETRICS.

INTRODUCTION.

THE first chair of midwifery was established at Edinburgh, in 1726, but the art is as old as the human race, and portions of it were as well understood three thousand years ago as they are to-day. Yet it has many unsolved mysteries, if, indeed, it does not cover the mystery of mysteries—the origin of a human being. The belief that any practitioner is a competent obstetrician is absolutely wrong. It is preëminently a specialist's work, to which but few men are really fitted. It is closely allied to surgery, requiring at times the acme of surgical technique, coolness in emergencies, and prompt decision. The modern advance of the art has been along surgical lines. It also often requires rare diagnostic ability, profound therapy, laboratory detail, and a knowledge of medicine, pediatrics, mental diseases, and jurisprudence, together with a fund of sympathy and firmness, to do the very best for a woman in her hour of travail. He must have "clean hands and a pure heart" who would practice this art.

It is, above all, practical. The young graduate will not be called upon to perform great surgery, but he surely will be forced to do some obstetrics, and his first case may bring him face to face with a crisis in which life and death are involved.

The study of obstetrics resting upon a knowledge of anatomy and physiology, and never being taught until these are finished, it would seem superfluous to more than touch upon a few particular points in these subjects.

CHAPTER I.

ANATOMY.

THE FEMALE PELVIS.

EVERY organ of the female is modified, sexually, the breasts and pelvis being the most important.

The female pelvis differs from the male in being relatively larger and lighter, the inlet and outlet of actual larger size, while the basin and tuber-ischii flare more, the iliopectineal line being thereby

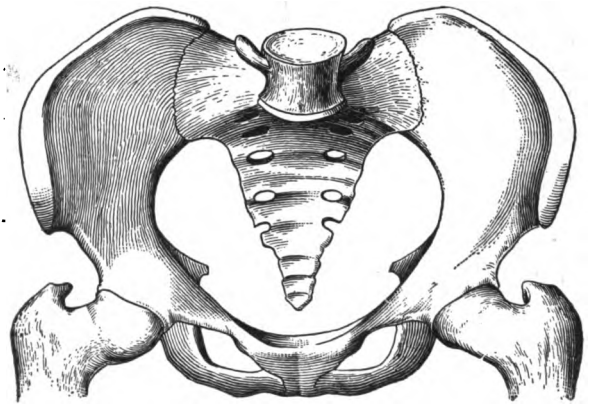


Fig. 1.—Normal Female Pelvis. (GRANDIN AND JARMAN.)

rendered more prominent. The inlet or superior strait is heart-shaped, the subpubic angle rounded into a Roman, not a Saracenic, arch, the obturator foramen is circular, the rami face outward, and the true pelvis is more shallow than in the male.

Points to note are the promontory of the sacrum, pectineal eminences, and the line running therefrom downward and backward from the inbulging of the acetabulum, dividing the side of the pelvis into anterior and posterior inclined planes.

Articulations.—There are seven joints in the pelvis, of which five are amphiarthrodial, which soften toward term and allow of considerable motion. A synovial membrane has even been discerned at times. Occasionally with a finger on the symphysis while the woman walks a rocking motion can be felt. This softening allows changes of

shape to occur in the Walcher position after symphyseotomy. The sacro-vertebral angle is formed by a wedge-shaped cartilage.

Each rigid bone is more or less yielding. Notice that the symphysis is higher than the rami, so that the head will slide to either side on to the inclined planes; also that the inclination of the pelvis

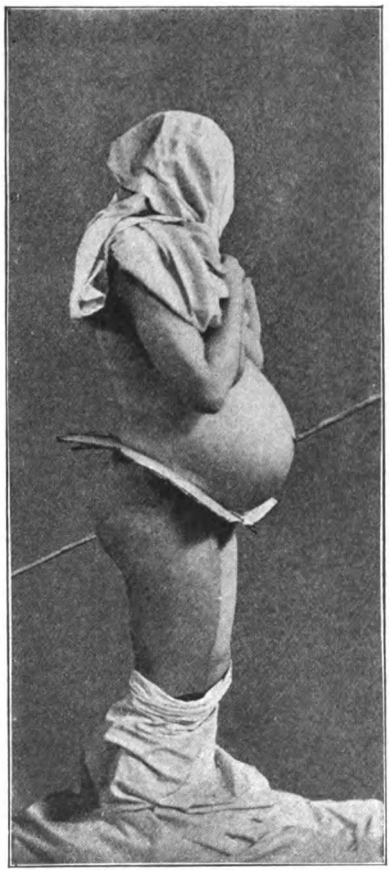


Fig. 2.—The Plane and the Axis of the Superior Strait, or Pelvic Inlet. (GRANDIN AND JARMAN.)

Fig. 3.—The Plane and the Axis of the Inferior Strait, or Pelvic Outlet. (GRANDIN AND JARMAN.)

will slide the head, if posterior, down onto the anterior planes. The action of the false pelvis is that of a funnel to direct the head to the inlet.

The true pelvis seems larger than either outlet or inlet. This is

more apparent than real, the spaces being taken up with muscle. It is nearly circular in shape. The inlet, then, is heart-shaped, the pelvis circular, the outlet lozenge-shaped.

The plane of the inlet is 55 degrees with the horizon when the woman is erect. The axis of this plane, or line perpendicular to all lines in the plane, will about pass from the tip of the coccyx through the center to the umbilicus. The head, on engagement, must do so on this axis, either acting from force behind or traction in front. When the woman is prone in bed and the physician standing at her knees, it will about reach the floor at his feet, the excavation his waist, and the outlet his face.

The true pelvis is a bent cylinder, 4 centimeters (1½ inches) in front and 19 centimeters (7½ inches) behind; the last is made up of 14 centimeters (5½ inches) of bone and 5 centimeters (2 inches) of perineum. The anatomical inlet is not always identical with the true or obstetrical inlet, which is the smallest anterior-posterior diameter.

The lozenge-shaped outlet is formed by the symphysis, tip of the coccyx, and two tuber-ischii. Its plane is inclined to the horizon 10 degrees. It is completed behind by the two sciatic ligaments. The structures passing through the great foramen, the pyriformis muscle, etc., act as buffers for the head. In any plane there would be part of the circumference formed by such a soft pad which will relieve pressure, retard movement at that point, and direct lines of force.

The axis of the outlet will touch the promontory of the sacrum. As the head emerges, with the woman on her back and the physician at her knees, it will, as stated, point to his face.

The loci of the axis of all the pelvic planes is known as the curve of Carus. It is approximately a portion of a circle centered 4 centimeters (1½ inches) in front of the symphysis with a 19-centimeter (7-inch) radius. It will about pass through the umbilicus. In this path the presenting part must travel and all force be successively applied. Considerable variations in the curve of the sacrum exist which greatly modify this curve. It is rarely a circle, but more often a parabolic curve. A knowledge and a realization of it for every part of the canal are required, especially in any operative efforts towards delivery.

Pelvic Measurements.—The average measurements of the pelvis must be known absolutely and forever remembered. They must be carefully measured before the last month in every case of labor.

The measurements of the superior strait or inlet are as follows:—

The *conjugate vera,* or anterior-posterior distance between the promontory of the sacrum and the symphysis, is 11 centimeters ($4^1/_3$ inches). The *transverse,* taken just behind the ilio-pectineal eminences, is 13.5 centimeters ($5^1/_3$ inches). The *oblique,* from the sacro-iliac articulation of one side to the ilio-pectineal eminence of the other, is 12.75 centimeters (5 inches). The circumference is 40.5 centimeters (16 inches). The psoas muscle lessens the transverse diameter 5 centimeters, which further intensifies the oblique.

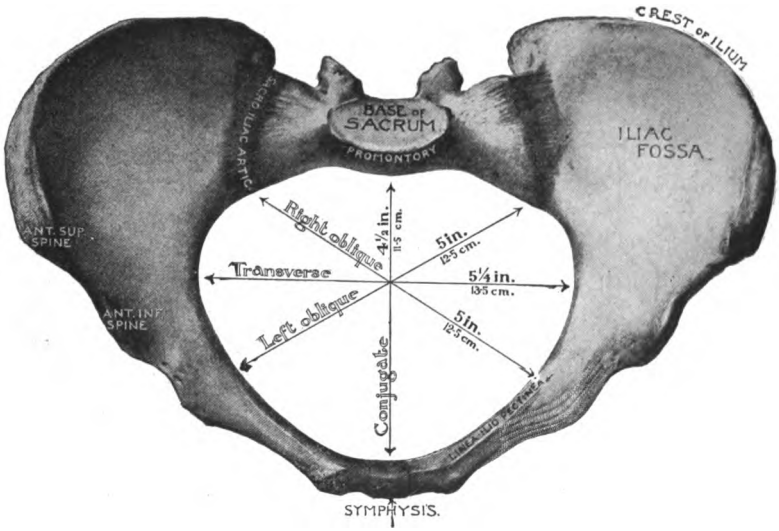


Fig. 4.—The Superior Strait of the Pelvis, Showing its Form and Diameters. (EDGAR.)

The true pelvis is circular in shape, 11 centimeters ($4^1/_2$ inches) in all diameters.

The measurements of the inferior strait are the *transverse,* between the rigid tuberosities, 11 centimeters ($4^1/_2$ inches); and the *anterior posterior,* from the symphysis to the tip of the movable coccyx, about 12 centimeters (5 inches). The circumference of the outlet is 45 centimeters (18 inches). The floor of the pelvis is closed by the structures forming the perineum, whose function it is to force the head forward and upward under the symphysis.

In Latin countries the oblique diameters are named from the anterior; the Germans and English name them from the posterior. From the left parietal to the right sacro-iliac articulation is called

by the French the left oblique, by the English and Germans the right oblique. This can be remembered by the little phrase "right back." Because of the better development of the right side of the body, the right side of the pelvis is often slightly so.

Inclined Planes.—On each side of the true pelvis there are two planes: anterior and posterior. They lie on either side of the line joining the pectineal eminence and the tuberosity of the ischium. It is faint above, becoming well marked at its termination below. This division is a hard, bony ridge, from which the head will tend

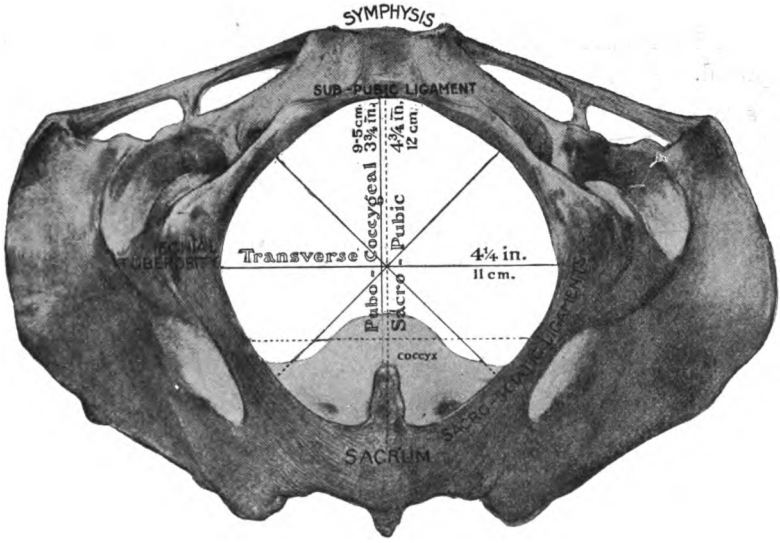


Fig. 5.—The Inferior Strait of the Pelvis, Showing its Form and Diameters. (EDGAR.)

to slip forward or backward. The posterior plane is a smooth plate of bone above and closed by the sacro-sciatic notches below. The anterior plane is the smooth surface of the ischium, anterior to the ridge, the obturator membrane, and the smooth ramus of the pubes. A line through the sacro-coccygeal articulation to the highest point of the sacro-sciatic notch would bisect the posterior plane. A line connecting roughly the mid-points of the two rami would bisect the anterior plane.

The lateral wall may be considered in a general way, then, as a bony ridge dividing an anterior from a posterior groove. The direction of the anterior is downward and forward, ending under

the pubes; the posterior, while not so well marked, is also downward and forward to the same spot. Any rounded body started upon either groove will follow the least resistance and end under the arch of the pubes. This explains the anterior rotation of the head in posterior positions. Once the head is under the arch, the perineum will hold it there as well as force it out. In normal cases the occiput will always turn forward, but, failing in this, will rotate back into the hollow of the sacrum. The child usually lies with the occiput forward, because the belly of the child conforms to the lumbar curve of the mother and because the head must also be in a lateral position from the prominence of the sacrum, and, as the inlet is inclined to the horizon, it tends easily to slide down the ramus rather than upward.

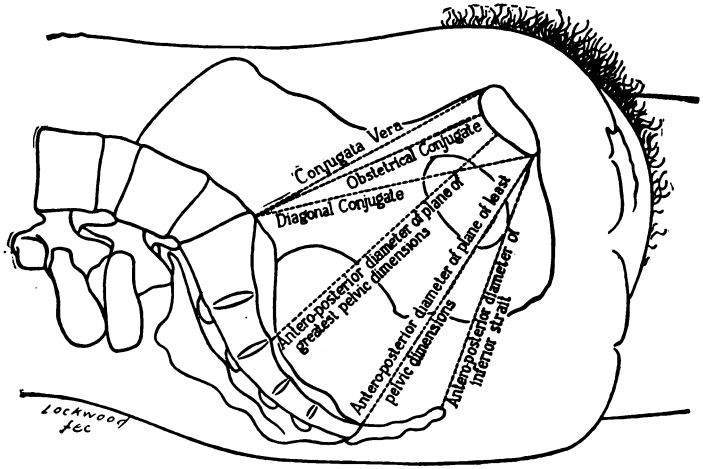

Conjugata Vera
Obstetrical Conjugate
Diagonal Conjugate
Antero-posterior diameter of plane of greatest pelvic dimensions
Antero-posterior diameter of plane of least pelvic dimensions
Antero-posterior diameter of inferior strait
Lockwood fec

Fig. 6.—Diagram Showing Pelvic Planes. (WILLIAMS.)

FEMALE GENERATIVE ORGANS.

Soft Parts.—The female genitals are divided into external and internal, for copulation and fecundation. The external are the labiæ majoræ and the nymphæ, vestibule, clitoris, glands of Bartholin, vagina, and hymen.

The vagina is a short canal with anterior and posterior walls in apposition, giving to the cross-section an "H" appearance. It is capable of enormous distention at childbirth, but never afterwards regains its virgin caliber, the folds remaining permanently flattened.

The hymen is a membranous reduplication more or less closing the entrance of the vagina, once thought to be evidence of virginity

and now known to have little weight as a proof of chastity. It is usually ruptured at the first coitus, and persists as the carunculæ myrtaformes. Great variation is observed in the shape of the hymen.

Occasionally it is impervious, and at other times is so tough and inelastic as to be a bar to the consummation of marriage. There is no agreement as to the embryonal structures from which it is developed and it is peculiar to the human species.

The muscles of the pelvis fill it out, and, as stated, act as pads for the head. Those of the perineum play an important part in directing the head by their tonicity, while in the second stage the whole abdominal group and diaphragm assist in expulsion. It is quite important that they be not weakened by artificial support.

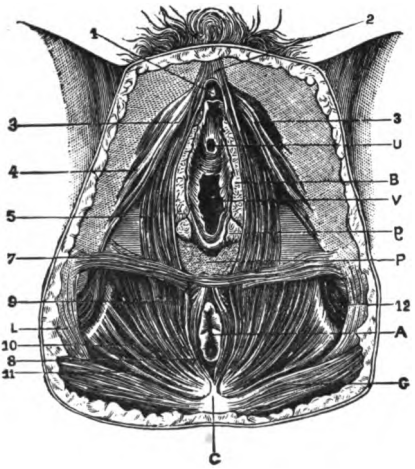


Fig. 7.—Female Perineum. *A*, Anus. *B*, Bulbo-vaginal. *C*, Coccyx. *G*, Glutens Maximus. *P*, Perineal Body. *U*, Urethra. *V*, Vagina. *g*, Vulvo-vaginal Gland. *1*, Clitoris. *2*, Its Suspensory Ligament. *3*, Crura Clitoridis. *4*, Erector Clitoridis. *5*, Bulvo-cavernosus. *7*, Transversus Perinæi. *8*, Sphincter Ani. *9* and *10*, Levator Ani. *11*, Coccygeus. *12*, Obturator Externus. (YOUNG.)

The pelvic outlet is closed by the perineum, broader than in the male and perforated by the vagina. Its essential part is the levator ani, horseshoe in shape and attached all around the pelvis. It has been termed the pelvic diaphragm, for it acts as does the diaphragm in moving synchronously with it in respiration. It undergoes hypertrophy during labor. It has also been likened to a scoop-shovel, thin at the edge, stronger behind, and so hollowed as to direct all

descending objects forward and upward under the arch. It is a very important structure in the female, passively supporting the viscera and actively assisting in delivery. At labor it is the cause of the head rotating to the front from the oblique diameter, and holds up the head lest it injure the rectum, and prevents too sudden delivery.

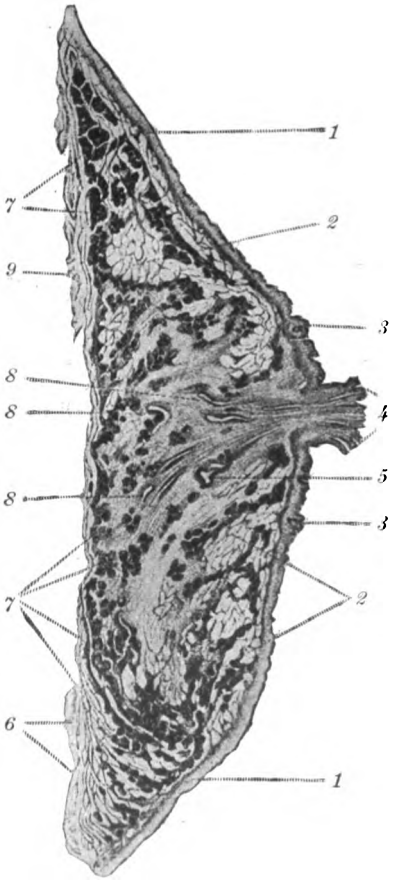


Fig. 8.—Section through a Breast at the Third Week of Pregnancy. *1*, Skin. *2*, Fat. *3*, Tubercles of Montgomery. *4*, Nipple. *5*, Milk Duct. *6*, Muscle. *7*, Glandular Tissue. *8*, Milk Ducts. *9*, Muscle. (EDGAR.)

The parturient canal exists only at the end of the second stage of labor and is the whole tract the child has traveled from fundus to vulva. At labor it consists of the womb, constricted at the internal

ring of the cervix, the true pelvis, and the dilatable soft parts. At labor the womb has reached its limit of extension and the soft parts soon will, whereupon the former will contract. The cervical constriction is overcome in the first stage and the soft parts in the second. The cervix is dilated by the liquor amnii, the soft parts by the head. The canal has two curves reversed. That of the womb bends backward over the lumbar curve of the mother; the pelvis and soft parts follow the curve of Carus. While the internal os is normally the point of division between the two portions of the canal, after long-continued labor this is not so and there is found to be present the contraction ring of Bandl. The formation of this ring is somewhat as follows: With every pain the fundus is lifted upward and backward. This serves the purpose of lifting the bladder out of harm, and it is towards the posterior wall of the vagina that the head is directed. Now, the fundus is much more muscular than the lower segment; if, then, contractions be continued for some hours, with no advance of the head, the fundus actually draws itself up over the head, leaving the lower segment dangerously thin and liable to rupture. The line of division is felt at the thicker upper part as a definite depression or ring. While all authorities agree as to the presence and causation of Bandl's ring, they differ as to its exact site. Some consider it formed at the internal os; others, a little above, at about the attachment of the peritoneum to the womb. Both sides have prominent adherents and it is of little practical importance which view is correct.

The breasts are developed and specialized sebaceous glands, Absence of the breasts is exceedingly rare and only associated with undeveloped genitals. Supernumerary breasts are only curiosities. These organs are undeveloped before puberty, and atrophy in old age. They are composed of fifteen or twenty sets of lobules around a tubula lactiferi, dilated into ampullæ before opening on to the surface of the nipple. The secreting surface of the ascini is a layer of granular, polyhedral cells lining the alveoli. The whole is imbedded in a stroma of connective tissue and fat.

Nipples are of many shapes, surrounded each by an areola deepening upon any congestion of the womb. Scattered in this are fifteen to twenty enlarged sebaceous follicles, known as the glands of Montgomery. Late in pregnancy there is often a secondary areola that extends two or three inches from the nipple. The nipple contains erectile tissue, brought into action by friction or nursing. Milk is not a sign of pregnancy, but may be seen in any pelvic irri-

tation. The blood-supply to the breasts is from the internal mammary and thoracic branches of the axillary arteries. The lymphatics are superficial and deep. The superficial are at the periphery and run to the axilla. The deep lymphatics perforate the chest wall and join the glands under the thorax.

The internal genitals are the uterus, fundus and cervix, the Fallopian tubes, and the ovaries.

The womb, normally antiverted, is 8 centimeters by 4 centimeters by 2 centimeters (3 by $1\,^1/_2$ by $^3/_4$ inches), with a cavity 6 centimeters ($2^1/_2$ inches) deep, and is the essential retaining organ

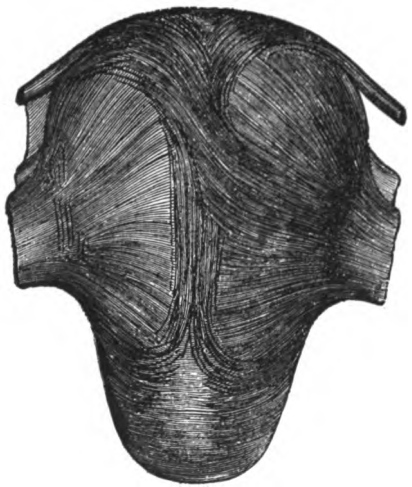


Fig. 9.—External Muscular Layer of the Uterus. (GRANDIN AND JARMAN.)

for the fœtus. The opening of the cervix in virgins is round, in parous women stellate. The womb is freely movable, and descends and rises with each respiration.

The uterus and tube are developed from one embryonal structure, the duct of Müller. The lower parts of the two ducts fuse to form the womb, which in animals usually persists as a bicornate uterus and occasionally in man is the same or exhibits a septum.

The endometrium, resting directly on the muscle, is 2 millimeters thick. It is ciliated, the motion being from above downward, the same as in the tubes. The glands are merely invaginations of the membrane, secreting an alkaline fluid. Between the lower level of the glands and the muscularis is an interglandular tissue of embry-

onal type, over which much confusion exists. Leopold considers it a flattened lymph-gland (Lymphdriisenflache).

The muscle forms the bulk of the organ, nonstriated, and mixed with elastic connective tissue. The layers are so interwoven, especially under the hypertrophy of pregnancy, as not to be separable, but contract in one common direction toward the internal os.

The broad, round, and sacral ligaments support the womb. The broad ligaments cover the Fallopian tube and uterine vessels and are triangular on section. The round ligaments elongate as pregnancy advances, and assist at labor in holding forward the fundus.

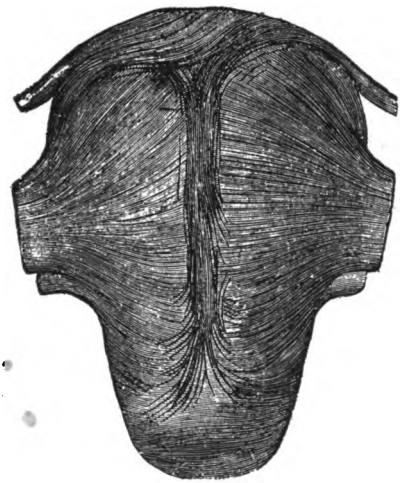


Fig. 10.—Internal Muscular Layer of the Uterus. (GRANDIN AND JARMAN.)

The blood-supply is by the uterine artery from the hypogastric and secondarily from the ovarian, a branch of the aorta. The uterine artery divides at the supravaginal portion of the cervix. The smaller branch, the cervo-vaginal, supplies the cervix and upper vagina. The larger, main branch, excessively convoluted, runs up the side, sending branches deep into the body of the womb, and at the insertion of the tube divides into three terminal branches: to the ovary, anastomosing with the ovarian, to the tube, and to the fundus. The two uterine and ovarian arteries freely anastomose together and with each other. The veins form a plexus along the arteries, uniting in the hypogastric.

The lymphatics are not many as such, but the interglandular

tissue spaces between the muscle planes and the subperitoneal areola tissue are all large, although poorly defined, lymph sini. From the fundus one set of lymphatics, joined by those from the ovary, reaches the lumbar glands; another goes direct to the hypogastric, while those from the cervix and upper vagina run mainly to the hypogastric, also with a few to the iliac.

In general, then, the lymphatics of the womb from the lower fourth run to the hypogastric, the upper three-fourths to the sacral and lumbar. The fundus is poorly supplied with lymphatics. This has a bearing on sepsis, in which the glands are rarely enlarged, and gives a reason why in low implantation of the placenta, where the lymphatics are more numerous, sepsis is more frequent.

The nerve-supply is cerebro-spinal by a few filaments from the third and fourth sacral, but the bulk of its innervation is from the sympathetic system. Branches from the internal iliac plexus run along the sacro-uterine ligaments and form a large cervical ganglion behind and to one side of the cervix, from which fibers pass to all parts of the uterus.

The connective-tissue planes run out from the womb as a center, first to either side, secondly around the rectum to the sacrum, and thirdly anterior around the bladder to the symphysis.

The Fallopian Tubes.—These are conductive tubes for the discharge of the ova, reaching from the ovary to the womb, covered by peritoneum except at the outer end, and 8 to 14 centimeters long. The uterine portion extends from the cavity to the edge of that organ, and is the narrowest part of the lumen. The isthmus is from the wall of the womb outward to the ampulla, and is the bulk of the length. The ampulla, infundibulum, or fimbriated end is extra-peritoneal, funnel-shaped, retro-curved, and reaches to the ovary. The lumen of the uterine portion will barely admit a bristle; in the isthmus it is 2 to 3 millimeters; in the ampulla, 7 millimeters. One of the fimbriæ is attached to the ovary, forming a gutter for the ovum, and is called the fimbria ovarica. The tube has an inner circular and an outer longitudinal layer of muscle. Williams has shown an inner longitudinal layer to be present in the uterine portion. The mucosa is a ciliated, columnar-celled membrane. Four reduplications and their folds give it a very complicated cross-section, increasing in complexity from uterine to fimbriated ends.

The Ovaries.—These are two almond-shaped organs behind the broad ligament, and attached thereto at the hilum by the mesovarium. An infundo-pelvic or suspensory ligament runs to the pelvic

wall, while a second extends to the uterus just below the tube. The ovary is not covered by peritoneum except at its base, and projects free into the abdominal cavity. The outer layer, or cortex, is covered by the tunica albuginea, which is a single layer of cells. The cortex is a stroma of connective tissue, through which are scattered the Graafian follicles. The medullary portion is loose connective tissue supporting the blood-vessels. The presence of unstriated muscle-fibers has been thought to prove that the ovary was erectile under sexual excitement, thus favoring the rupture of the follicle at that time. Fibers from the sympathetic system richly supply it, and there seem to be scattered ganglionic cells.

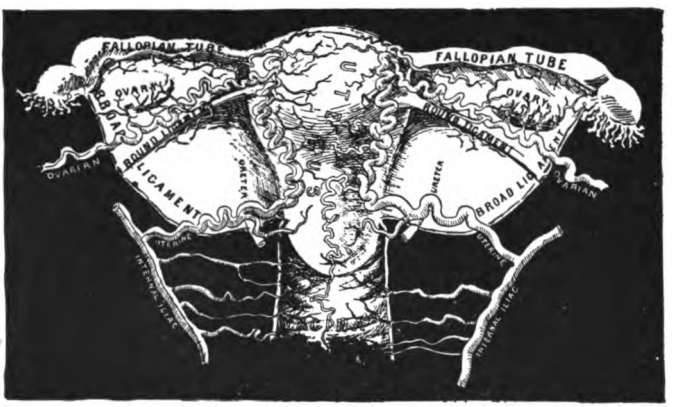


Fig. 11.—Blood-Supply to the Internal Female Genitals. (YOUNG.)

Whether there is an internal secretion of the ovary or not has been studied for some years, and the weight of proof seems to favor that belief. The effects of castration and the results of grafting and transplanting done by Kanauer, McConc, and others would seem to prove this, but the subject is far from settled. From the structure of the ovary it would hardly be classed as a ductless gland.

The obstetrical interest in the ovary centers around the primordial ova of Waldyer and their development into mature Graafian follicles. Each primordial follicle contains one, or occasionally two, ova surrounded by a single layer of spindle epithelial cells. They remain the same size from birth until they develop into Graafian vesicles. At birth these number a hundred thousand, and are no less than forty thousand at puberty. The first step in development is the change of this spindle epithelial wall into a single cuboidal

layer of cells and later into several layers. By the degeneration of cells the follicle becomes vacuolated and filled with fluid—the liquor folliculi. The ovum is at one side, attached to the wall and surrounded by a mass of cells known as the discus proligerus. The lining cells form the membrana granulosa. All this time the ovum is increasing in size and becomes covered with a vitelline membrane. The connective-tissue covering of the follicle, known as the theca folliculi, of two layers, also increases, and the cells become larger than the surrounding ones from which they developed, become pigmented, and are now known as lutein cells. These enter into the healing of the space after rupture and discharge of the ovum, multiplying rapidly and dividing up the clot into festooning layers until they fill it and organize it. Degeneration of the lutein cells and contraction end the corpus luteum, leaving a white scar on the ovarian surface. That the lutein cells are of connective-tissue origin is now conceded by most authorities, although a few still adhere to their being epithelial.

CHAPTER II.

PHYSIOLOGY.

MENSTRUATION.

About the fourteenth year in the United States, depending on the social conditions, education, precocity, hard work, moral teaching, and temperature, the girl begins the function of menstruation. This is the culmination but not the completion of puberty, a sexual change or maturity, for attracting the male, with the ultimate end, by sexual union, of perpetuating the species. It does not mean that she could not be impregnated before, nor that she is now best fitted to be.

At this time, under the influences of stored nervous energy, the body rounds and develops, the breasts enlarge, there is a growth of hair on the pubes, menstruation begins, also sexual feeling, and, as in the physical, so in the moral, material, and mental nature, profound changes take place until the sexual psychosis is established. Puberty and the climacteric, the alpha and omega of reproductive life, are two important crises for every woman. While undergoing this change the girl should be at home, surrounded with quietness. She should sleep long and regularly, eat simple food, not work, especially mental effort, to the point of fatigue, have little company, and be free from calls on her nervous energy, with plenty of outdoor exercise. Our modern system of educating girls is the worst possible. At about this time they are undergoing the strain of high-school life, with perhaps music added and more or less social requirements, when from thirteen to fifteen they had better be doing nothing.

It is certain that if the activity of the girl is used up in study, it will handicap this developing function; and the increasing prevalence of dysmenorrhœa in school-girls is a warning that our present system is a violation of nature. A reform here is urgently needed, for "Is not the life more than meat, and the body more than raiment?"

The emotional nature of the girl is unstable at puberty. If there is hereditary tendency to insanity, it is a critical time; there is even an insanity of pubescence. The mammary glands may become quite tender, especially at menstrual periods, and persist so for

months. Gentle rubbing with chloral camphor is usually sufficient. While at puberty the girl suddenly becomes a woman sexually, she is not yet fitted physically for maternity, but lacks full development until about her twentieth year.

At about the fourteenth year, then, she begins a function to last about thirty years. Induced a little earlier by sexual knowledge and nerve-excitement, it is retarded by poverty, hard work, isolation, and cold. In Lapland and among the Esquimaux menstruation begins at eighteen to twenty-three and occurs only two or three times during the summer in nine out of ten cases. In Egypt menstruation begins at ten; Siam, twelve; Sweden, eighteen to twenty; while on the Faroe Islands it is often absent. Occasionally it starts at birth, usually followed by nymphomania, or it may be totally absent. In temperate countries, to begin after thirty is very rare indeed, though cases of delayed menstruation are occasionally reported. One case reported by Wolf: married at thirty-four, menstruated at forty-five, delivered at forty-six, has never been duplicated. Menstruation is a periodical discharge of blood from the vagina, lasting on an average from four to five days, at twenty-eight-day intervals. Every woman is, however, a law unto herself, both as to length of flow, length of interval, and profuseness—no two are alike, departures from the individual's own rule only being pathological. Profuse menstruation is usually a sign of marked sexual feeling. The flow marks a lost opportunity of impregnation and the beginning of a change in the womb, fitting it to again receive and nourish an ovum. Its synonyms are molimenia, courses, sickness, custom of women, monthlies, flowers, reds, catamenia, show, etc. There are many theories to account for the twenty-eight-day periodicity. Darwin thought it inherited from our ascidian ancestry, there being a period of high tide, abundance of food, etc., with each full moon. Menstruation, however, occurs regardless of the moon's changes and uninfluenced by it, although light powerfully affects it, as shown by the late or absent menstruation in Arctic latitudes and the early flow in the tropics. The best explanation is that of Havelock Ellis: "Bearing in mind the influence exerted on both the habits and emotions of animals by the brightness of the moonlight nights—the periodical recurring full moon, not merely by its stimulation of the nervous system, but possibly by the special opportunities which it gave for the exercise of the sexual function, served to implant a lunar rhythm on menstruation." It is certain that all the sexual orgies of savage races occur at the full-moon period. The moon-

struck and moon-gazing tendency of adolescence is probably as old as the race.

Wherever the sun (Bel) and the moon (Astarte) were worshipped, the latter rites were purely sexual and lascivious.

The flow is alkaline, of blood mixed with vaginal mucous cells, dark brown, and does not coagulate. It has a musty odor, from the sebaceous glands of the vulva. All the genital secretions are more active. The odor seems to be intense according to the pigmentation of the skin, being more marked in the dark-skinned. The average woman makes four to six "changes" of napkins daily, each representing about an ounce of blood, though fifteen to twenty changes are not uncommon. It leaves a greasy smear that differs from pure blood. It often begins and ends by a leucorrhœa for a day or two. It is equivalent to rut in animals, in whom, however, blood is seldom lost except in the anthropoid apes. The lower the scale of civilization, the less blood is lost. Among savages it is often very scanty. The tendency in Europe is for a secondary period to come on half way between the two periods, the mittelschmerz. The nervous development as well as the upright position of man is the cause of the flow. It is the period in the female, as is rut in animals, of the height of sexual feeling, and, except for ethical reasons, is the proper time for intercourse and the time most certainly followed by conception.

The first step in all nature towards a reproduction is a storing up of food and energy. This tissue-energy causes a swelling and bursting of a Graafian follicle, exactly as a ripened pod opens and discharges its seed. What lies beyond observation of this life-chemistry we do not know, except that in our higher physiology many of these vegetative functions are presided over by ductless glands. In pregnancy the thyroid increases and seems to neutralize the normal ovarian secretion, as shown in the subsidence of ovulation, and it has been suggested that ovarian secretion determines the wave of energy expressed by menstruation. The motor force is, any way, a nervous impulse from the sympathetic ganglion, causing congestion and associated with physical phenomena. At the same time a Graafian follicle ruptures and an ovum is discharged, together with a little blood, from the ovary into the tube. Some think the ovary the cause of menstruation or that menstruation is dependent upon the ovary. Pfheger suggests the pressure of a ripe follicle as the cause, and Strassman has produced heat by injecting the ovary. This is negatived by the fact that ovulation antedates menstruation, and extends from birth to old age and even during lactation, and also that in some cases

menstruation persists after ovariotomy. On the other hand, transplantation of ovary will cause a return of menstruation after ovariotomy and the bad symptoms of this removal will remain in abeyance. Our own McCone proved this. This last, however, may only be considered as going to prove the presence of an ovarian secretion.

Bossi has pointed out that menstruation may be present with congenital absence of ovaries and tubes; and Bouttner has shown that ovaries and tubes may be present, but no menstruation occur if the uterus is rudimentary. I believe the idea of Heape correct, that the cause of both is a common one, the result of some centric activity, upon which, while they are independent, both depend.

That rut and menstruation are the same is denied by Lawson Tait, Beach, and others, but there are too many similarities to consider them other than identical. There is a high blood-pressure and increased sexuality in menstruation, and the menstruation cycle may be divided into four stages:—

First.—A constructive stage, or a preparation for the reception of an ovum, lasting about a week, in which the decidua is formed, the membrane swells, the glands enlarge, and the connective tissue increases. An ovum arriving at a womb in this condition will lodge and mature.

Second.—A destructive or menstrual period of four or five days, in which the decidua is cast off with some loss of blood—phenomenon of menstruation.

Third.—A reparative stage of about four days, during which the deeper and unchanged gland-cells grow and reproduce the endometrium.

Fourth.—A period of quiescence of twelve to fourteen days.

Menstruation, then, while not, as Burdach thought, an aborted parturition, is closely related to the last preparedness of the womb for the ovum. This is the idea of Löwenthal, and rings true.

During menstruation the excretion of urea is increased and the temperature rises a little, to 99 degrees, and the pulse is fuller. Preceding its advent is a wave of heightened nervous sensibility and emotion. They are more affectionate, womanly, sexual, and with a vital energy often to restlessness. Fully 66 per cent. have this on close observation. Immediately prior to the flow there is a depression, a feeling of weight and heaviness, backache, it may be hysteria, crying, etc. The breasts and tonsils swell, thyroid enlarges, eyes are pigmented, ankles puff, and a congestive discomfort is present that usually disappears with the flow or lasts until the end. Fully

60 per cent. of women are disqualified for much exertion during the flow, being in a condition of mental and physical lassitude regardless of the amount, for these symptoms are not the result of the blood lost.

It must be remembered, too, that as menstruation occurs on the crest of a wave of emotion, so at the mid-period there is a depression with perhaps some pain, which is of great gynæcological, but not of much obstetrical, interest.

During menstruation the blood transudes through the delicate capillaries of a thickened and congested endometrium by diapedesis. The membrane, while 8 millimeters thick, swollen, dark, and soft almost to liquefaction, is still intact. It is separated by a sharp division from the muscular tissue of the womb. The glands, 0.5 to 0.75 millimeter, are visible to the eye. The epithelium may be absent in a few places, but it is not generally so. In the upper layer of the mucosa is a network of dilated and hypertrophied capillaries. It is a transudation of blood and there is no degeneration of membrane.

The normal establishment of menstruation is of considerable importance. It is sure to be irregular both in time and amount for the first few months and not regular for at least one year; but after that it should be uniform in both time and amount. The girl should be protected from damp and cold at each period; and if much discomfort arises, treatment should not be delayed from any notions of delicacy. Irreparable damage may result from neglect in this first year. The girl should also know what to expect and be instructed in ordinary rules of hygiene, and I know of no one so fitted to initiate her into the mystery of sexual knowledge as her own mother. Here you will find such a total lack of maternal duty that I want to urge, in passing, that you go out of your way to impress this on every mother you meet. It is her place to do this. It seems the usual rule that girls are married and face to face with maternity in an appalling state of ignorance of the whole subject. Those who learn some facts as forbidden fruit are sure to gain false ideas and mock modesty. I do not claim to a greater knowledge of what a girl should know than the Creator, but consider that when He sexually matures her, it is a sign that she is also mentally fitted for sexual knowledge. I have known girls to pack the vagina with snow in their fright at the first blood, and never recover. They are sure to be on a physical strain and keep guessing, if ignorant, until they know all about it, or think they do.

Once established it should remain regular, unless suppressed normally at pregnancy, throughout sexual life. Pathological conditions, as anæmia, chlorosis, phthisis, emotion, or cold that suppresses this function, are not obstetrical. So also excessive flow, which should call for prompt investigation of the cause.

At conception menstruation ceases, to recur some months—six or eight—after delivery if nursing, or as many weeks if not. It is, as in the beginning, irregular for a period or two, but is soon again normal. It marks a fitness on the part of the womb for conception once more. Menstruation during lactation is no different than at other times. It does not affect the child or alter the milk. Fifty-seven per cent. of women have amenorrhœa when nursing; 43 per cent. menstruate a few times only. There is little probability of impregnation when absent, but I have known a few cases when women have gone some years without menstruating, one pregnancy following another without a show.

Vicarious menstruation is a term used for a flow of blood from some other source, replacing the normal uterine flow. It is closely connected with either phthisis, melancholia, or neurotic psychosis. Medical literature teems with these curious cases, often taking the form of stigmata.

After about thirty years the woman again goes through a crisis —the menopause, climacteric, or change of life. Menstruation is lessened and becomes irregular in time, occasionally varied by a profuse flow. The genitalia shrink, there is a tendency to lay on fat, and the peculiar sexual psychosis disappears. This, safely passed, should begin the best, most useful, and happiest part of a woman's life; the one freest from care and the rest after labor, to be wished for rather than to be dreaded.

Keep clearly before you the emotional life of a woman during these thirty obstetrical years, and the more you study her the less you will really know of her, for "age cannot stale nor custom wither her infinite variety." The graduate of Vassar will still always consider her baby's teething as an index of its mental capacity. She is very easily influenced by her love, but "Heaven knows no rage like love to hatred turned, nor hell a fury like a woman scorned."

OVULATION.

Ova are the development of certain epithelial cells that surround the ovary and were included in its structure when developing. They were first seen by Cruickshank in 1797, and studied by

Carl von Baer in 1827. They are of spherical shape, 200 millimeters in diameter, and are the largest cells in the human body and visible to the naked eye. Each mature ovum is surrounded by a mass of cells lining a cavity—the discus proligerus—the whole lying to one side of a vesicle. The lining layer of cells, fluid, discus proligerus, and ovum are known as a Graafian follicle, $^1/_{125}$ of an inch in diameter. They develop early, being mature at birth. Nature is lavish in providing for species perpetuation. Fully seventy thousand are present at birth. Of this number thousands are never fertilized, and thousands more, when fertilized, do not lodge in the womb. Of these

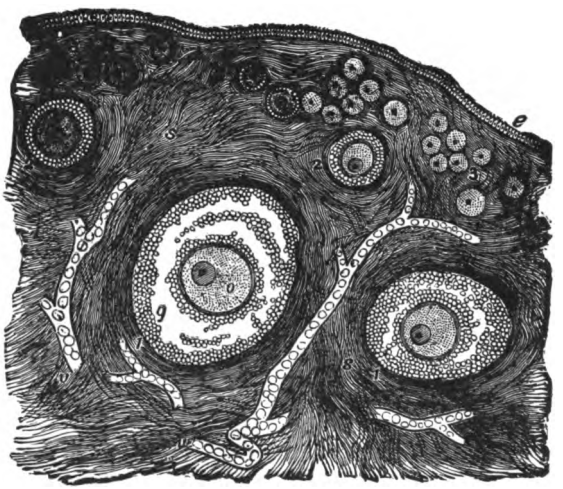


Fig. 12.—Section of an Ovary. *e*, Germ Epithelium. *1*, Large-sized Follicles. *2*, *2*, Smaller-sized Follicles. *o*, Ovum within a Graafian Follicle. *v*, *v*, Blood-vessels of the Stroma. *g*, Cells of the Membrana Granulosa. (YOUNG.)

few the majority are lost, and the infant at birth is the apex of an increasing loss at every backward step. Of the children born, but few reach maturity. At puberty the ova begin discharging at intervals; probably several times a month as they successively mature, and with certainty during the congestion and excitement of sexual intercourse.

Rupture occurs by the thinning of the ovarian tissue over the follicle. This breaks and discharges the liquor folliculi, discus proligerus, and some blood into the peritoneal cavity, usually into the fimbriated end of the tube, which is applied for that very purpose.

As sexual feeling, ovulation, and menstruation are all governed from one central point—through the sympathetic system—they normally act at about the same time, the whole process being essentially one of congestion; that of sexual excitement being sufficient to burst the distended follicle. In some animals the process is regularly periodic, and the young are born therefore at a time of plentiful food-supply only. But in woman, her ages of subserviency to the male passion and her subjection to the "desire of her husband," have largely altered any periodicity she may have had. About twenty to thirty follicles rupture annually, probably in woman as in animals, always at the time of menstruation. Any ovulation much before or after menstruation is lost, such ova finding the womb in no condition to nour-

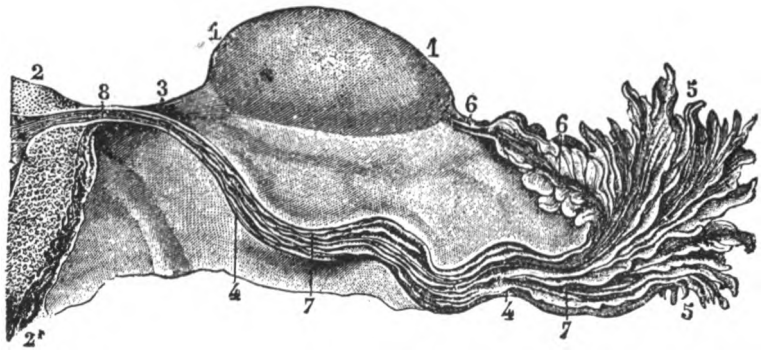


Fig. 13.—Section of a Fallopian Tube. *1*, Ovary. *2*, Uterine Artery. *3*, Isthmus of Tube. *4*, Beginning of Tube. *5*, Fimbriated End of Tube. *6*, Gutter Fold to Guide Ovum. *7*, Four-fold Convolutions. (GRANDIN AND JARMAN.)

ish them. The ovary is not a gland that secretes ova, but the ovum is a retained embryonal cell—the union of the original male and female elements of the embryo, infolded and retained.

The ovum is usually taken up at once by the tube on the same side, but in many cases has been known to cross to the other tube, and a discharge into the general peritoneal cavity is normal in some types of life. The ciliary action of the membrane of the tube and peritoneum in Douglas's sac will insure the ultimate reaching of the tube.

CORPUS LUTEUM.

Certain changes occur in the ovary after the bursting of the Graafian follicle. The space of the discharged discus, etc., is filled

with blood. The cells of the theca folliculi proliferate and form a network; the blood-serum is absorbed, leaving the cavity filled by a mass, stained yellow from the hæmatin. It is an organized blood-clot, which contracts and leaves a scar known as corpus albicans. The size of the clot is 1.5 centimeters ($^3/_5$ inch) in diameter. This change requires some months to complete, and the functionating ovary shows several such corpi at varying points of absorption. This is known as false corpus luteum. Should, however, the discharged ovum be fertilized, the increased blood-supply to the pelvis, in which the ovary shares, causes a larger corpus luteum, from more exuded blood and slower absorption. Such a corpus is 2.5 centimeters (1 inch) in diameter and persists to the latter part of pregnancy before it disappears. This is the corpus luteum of pregnancy, or true corpus luteum, which differs only from the so-called false corpus in amount of blood, size and persistence, because of slower absorption. Fraenkel considers the corpus luteum as a gland formed each month with the definite function of giving a nutritive impulse to the womb, leading to a preparation of the endometrium for the ovum. If the ovum is retained the gland remains longer functionating; and if not, it disappears sooner. His experiments are of much interest, but the subject is still unsettled. It is certain that at no time in the month is the woman not liable to become pregnant.

THE OVUM.

The ovum proper is enclosed in a membrane known as the zona pellucida, 20 to 25 millimeters thick, hyaline and elastic. The ovum is clear and transparent. The bulk of the egg, the vitellus, can be divided into a vitellus formative and nutritive. The vitellus formative, also called the cytoplasm, forms the body of the egg and lies in layers at the periphery, but is alveolar in structure centrally. In the interstices of the alveolar structure are albumin granules: the nutritive vitellus or the deutoplasm. This last is food stored up to nourish the embryo while undergoing the first changes of development. In women the deutoplasm is not at first generally diffused, but is collected around the nucleus, and only later is it diffused in the cytoplasm.

The ovum seems to contain two organs, the nucleus proper and the "body of Balbiani." The nucleus of the germinal vesicle of Purkinje is 25 to 30 millimeters in diameter, spherical, and with a resistant limiting membrane. It is filled by a fluid and crossed in every direction by a skeleton of filaments, acromatic, and contain-

ing grains of chromatin. Under favorable conditions a nucleus can be made out. The "body of Balbiani" lies to one side in the cytoplasm. It was first seen and described by Ranvier, in 1871, as the vitellin body. It is round, 5 to 8 millimeters, clear, granular, and stains more strongly than the vitellus. Mertens, Stricht, and Winiwater consider it an attractive sphere.

SPERMATOGENESIS.

The testicle is formed from the germinal epithelium of the embryo, which buds into the surrounding cells and is known as sexual cords, exactly as in the ovary. During the second month these cords separate from the germinal epithelium, lengthen, round out, ramify without dividing, and join the Wolffian body, which later forms the excretory duct of these tubules. During this time and long after the sexual cords are lined with two types of epithelium: first, small epithelial cells; and second, large, round cells derived from the small by growth, known as male ovules or primordial spermazomes. The next step is for the cells to proliferate and become multinuclear (ovule groups of Balbiani), in turn to degenerate, leaving the seminal canals lined by small-celled, isomorphic epithelium (Prenant's state of one cell). So far there has been no hint of any evolution of spermatozoa.

A second series of changes now begins by a definition of the small epithelial cells (the cells of Sertoli) into spermagones, spermatocytes, and spermatids, all of which degenerate before reaching maturity. Only at puberty do the spermatids change to spermatozoa and the semen become fertile.

The spermatogones are in one row on the walls of the tube, tails small and outward, head nucleated, the nucleus with a filamentous cytoplasm and minute chromatin grains. The nucleus begins karyokinesis at once, is acidophile, irregular, and forms five or six limbs of chromatins. These five or six chromosomes by division increase to twenty-four. The karyokinesis of these spermagones results in a layer, after several divisions and a period of rest, during which they replace their lost chromatin. The spermatocyte resulting is very small. At two points of this nucleus the chromatin is in irregular lumps. These divide into four "groupe quaterne" and then collect to the center. From each lump a pair of long fibers grow out and loop back, and lastly the fibers break up into rings under the membrane. At this time the spermatocyte is large, but in maturing it loses size. From the spermatocyte the spermatid is directly formed, each

altering and developing into a perfect spermatozoön after the age of puberty, and are present until a variable age, when the testicle undergoes atrophy and the power of reproduction is lost.

SPERMATOZOA.

These are the essential male fertilizing elements. They were first discovered by Louis Ham, in 1677, and Hartsoeker, in 1678. In the vertebrates but one type is found, which closely resemble each other. They are immovable in the duct and body, requiring oxygen for motion, and will live indefinitely in the seminal fluid. They are slender filaments, 55 to 60 millimeters long, with a round head, 5 or 6 millimeters. Viewed flat, the head is oval; sidewise, pyriform, the anterior extremity tapering. The head stains like a cell-nucleus and is formed with two unequal segments. The small posterior one stains the deeper. The anterior segment (Bouton Cephalique) is energetically attracted by acids and covered by a hyaline membrane, or hood. The tail is an axis cord, exposed at the end and covered by several structures of unknown function. They move by an undulatory wave of the tail, giving a boring action to the head. They will travel three millimeters per minute, or their own length in a second. and with force enough to move ten times their weight. They are attracted to an ovum. They will live two weeks in the Fallopian tube after coitus, in some animals for months, resist freezing, alkalies, and narcotics, but are killed by acids.

It is safe to assume that the married woman has living spermatozoa constantly in her tubes.

The semen is alkaline, yellowish-white, mainly composed of the secretion of the prostate and vesicles, and in fertile males is swarming with motile spermatozoa. Secretion begins at fifteen to sixteen and lasts until sixty-five or later, about one drachm being discharged at the height of the orgasm.

COITUS.

This in the male consists of three acts:—

First.—Turgescence.

Second.—Friction and ejaculation.

Third.—Flaccidity.

The penis should not be withdrawn until flaccid, the semen remaining in the upper vagina or so-called "seminal lake." This is a relatively simple process in the male, who has only to deposit the

semen into the vagina. That the male is always ready and the female requires time should exactly reverse the usual practice, and coitus should only be at such times and after such excitement as is best promoted to favor an orgasm in the female. Coitus in the female is not merely effecting an orgasm, but must induce a condition of congestion that will bring into action the whole sexual apparatus. This is a slow process with her, and takes time. At orgasm, the

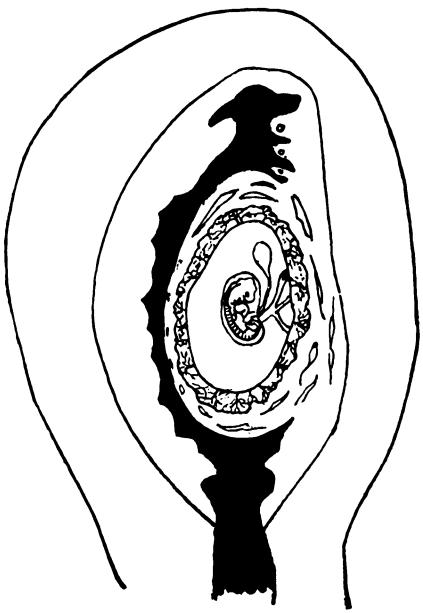


Fig. 14.—Section of an Early Pregnant Uterus. (MANTON.)

womb shortens, broadens, and descends; the cervix actually opens, and a suction is brought about that draws the semen into the womb. The congestion also ruptures a ripened Graafian follicle. The incident excitement increases the secretion of the glands of Bartholin, lubricating the vagina, narrowing the vulva, and holds the penis against the elongated clitoris, which reflex intensifies the pelvic congestion. Normally, if preliminary time is given the female, the two orgasms are nearly synchronous, the ejaculation of semen inducing the female orgasm at once and the womb sucking it up as it is ejaculated. While orgasm is not essential to conception, for semen deposited on the vulva or mons may reach the womb, it is the rule that the more excitement the surer conception follows. It is a fact that

sexuality in the female is not usually developed at marriage nor for some months afterwards, and about the first time they really experience the orgasm they find themselves pregnant.

Following the orgasm there is a relaxation and tendency to quietness that favors conception. Some women claim to know at once by some peculiar feeling that pregnancy has followed coitus, but it is probably only a greater satisfaction experienced. There can be no rules laid down, only broad principles given to couples for guidance. It should not be indulged in except with a willingness to accept the consequences if followed by pregnancy. It is not the right of either party, and must be mutual. Some men think it proper whenever they have turgescence enough to penetrate. This is wrong. The woman should be the guide, since she is the one to be excited, and it takes her time to arrive at this condition, nor can she always do so. It should be rare, not a matter of routine like saying one's prayers, nor *t.i.d.* As age comes on, it will be more infrequent; and, if watched for, there will be found in both sexes an annual and also monthly periodicity of sexuality. Intercourse with a merely submissive woman is masturbation. In no other act of life is self-control more desirable or followed by a greater reward, for, as elsewhere, quality is better than quantity, and a healthy woman will not cause any great suffering.

It is wrong to say that the feeling is greater in the male than in the female. In fact, judging by the risks taken, etc., it is stronger in the female, but they are dissimilar acts and not easily compared. I should consider the sexes equally sexual at least. It is a subject of great interest and importance, meaning in many cases happiness or estrangement.

Coitus to be followed by pregnancy must have, first, semen with spermatozoa; second, an ovum ruptured at or about coitus, and synchronous orgasm helps this; third, a womb membrane prepared for the fertilized ovum.

FECUNDATION.

All cells of the body are perishable, and the ovum also unless fecundated, when it is not only livable, but capable of developing into a new being having the functions and peculiarities of both parents and ancestry. The ovum, being caught by the fimbriated end of the tube, passes down and meets the ascending spermatozoa. One of these penetrates the zona pellucida, its tail is lost, and the head forms the male pronucleus, which, touching the female pronucleus, starts the

segmentation nucleus into division. Fecundation is now accomplished. Before this, however, profound and significant changes have occurred in the ovum, and it has been shown by Jacques Loeb in his studies in artificial pathogenesis that a certain amount of development is nutritive and not dependent upon the stimulation of the male element. And this has been shown by M. F. Liecher to be almost, if not quite, identical with the change from a liquid colloid albumin to a solid form either by saline solution or the middle piece of the spermatozoön.

CHAPTER III.

DEVELOPMENT OF THE EMBRYO.

DEVELOPMENT.

DEVELOPMENT has been studied in vertebrates and the few embryos of the human species obtainable of uncertain ages. The youngest ovum of a primate is of a monkey in the blastodermic stage. This is the ovum of Selenka. The next in time is fortunately human, the celebrated ovum of Peters, about five days old. It is not entirely perfect, but is of the utmost value as showing the early steps in the formation of the amnion and the great development of the mesoderm. Of such value was it that it revolutionized old ideas on that subject, and it shows that the human development differs much from the sequence found in other sources.

The following description will be a hypothetical one of the human embryo from analogy with other vertebrates, checked in by the few known human embryos of corresponding ages. It cannot be exactly correct. The subject of embryology might easily be gone into beyond the requirements of obstetrics or the character of this book.

Prior to the rupture of the Graafian follicle, the ovum undergoes a ripening or maturing process by the extrusion of two polar globules, the result of a reduction division of the nucleus. This, moving centrifugally, the protoplasm at the same time shrinking and leaving a space between it and the zona pellucida, undergoes mitotic division. In the human species the spindle is a perfect diamond, and the chromosomes are arranged regularly around the center with the definite number of eight, and with its axis inclined at right angles to the radius of the cell. As it reaches the surface of the protoplasm, the spindle rights itself and the upper part projects into the subzonal space. The spindle then divides equatorially and the extruded half is the first polar globule. A second is in like manner thrown off, and the result is a nucleus of one-fourth the original material. This is the "segmentation nucleus." This moves towards the center, becoming more membrinate in form as it does so. It becomes the female pronucleus should a spermatozoön enter the zona and be attracted toward it. These changes take place in the ovary, entirely independent of fecundation, and are preparatory only.

The chemotropism of the ovum having attracted a spermatozoön, its head perforates the zona and, losing its tail, becomes the male pronucleus. The head then enlarges by absorption, and its chromatin forms in irregular masses of a netlike appearance. The two now move together, but not in a straight line, for the female pronucleus moves toward the center while the male moves toward the female; the two therefore form an angular path. When in contact at about the center, they are without membranes, and between them is a small centrosome. To this the chromatin of each unites, keeping each to its own side of the spindle. As the spindle grows this arrangement cannot be followed, and we see around the equator a mass of V-shaped chromatin. It is thought, however, that there is no real fusion. The spindle then has sixteen chromosomes, the usual number for the human cell, but made up of eight each from the male and female. The segmentation nucleus now proceeds to divide into two unequal cells.

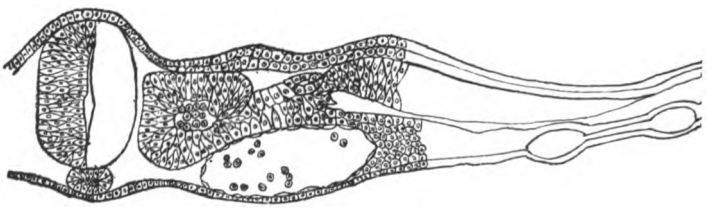


Fig. 15.—Transection through Dorsal Region. (MANTON.)

This division into two cells is the result of a constriction or fissure that deepens and divides the protoplasm into two masses, flattened by mutual pressure. In the center is the spindle, somewhat elongated and with the chromosomes halved and collected at either end. The spindle is the last to divide, leaving two perfect cells. A second division occurs in these, but not with equal speed, there being a time when there are but three cells present. The line of the second cleavage is at right angles to the first. With increasing rapidity division goes on, the larger cells dividing more rapidly than the smaller, resulting in surrounding them and forming a layer under the zona. The ovum, now known as the blastula, is a sphere of large cells surrounding a clear space and having the mass of the small cells attached to the under side at one point. These changes require about a week and take place in the Fallopian tube, where the ovum becomes surrounded with a gelatinous coating analogous to the white of the chicken's egg.

The next step is for the inner cells also to spread a layer around the inside of the ovum, with the bulk of the smaller cells accumulated at one point, which is the spot where the embryo is to be formed. In the center is a fluid of unknown constitution and under considerable pressure. The outer of these layers is in the future termed the epiblast, or ectoderm, while the inner is the hypoblast, or endoderm.

The first sign of the embryo is an oval thickening in the ectoderm, called the embryonic shield or germinal area. This is a little

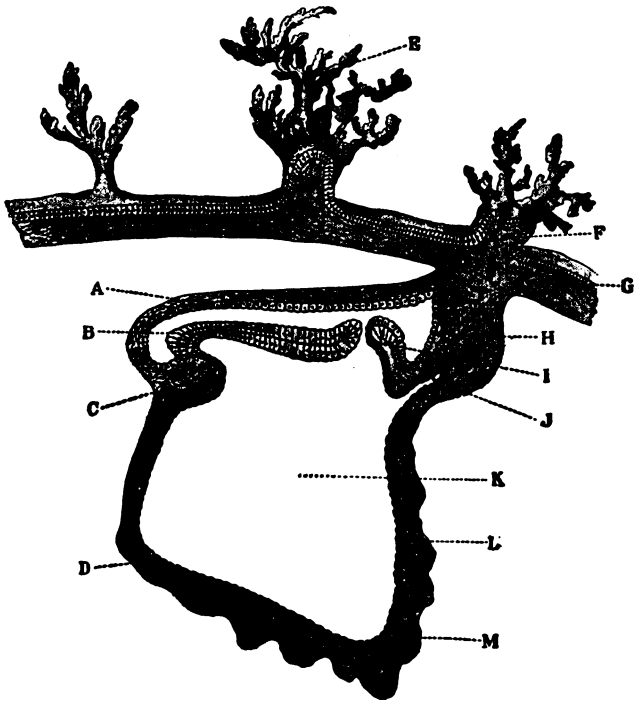


Fig. 16.—Section of Spee Ovum. *A*, Amnion (somatopleura). *B*, Medullary Plate. *C*, Anlage of the Heart. *D*, Mesoderm (somatopleura). *E*, Chorion villi. *F*, Chorion. *G*, Mesoderm. *H*, Bauchstiel. *I*, Primitive Streak. *J*, Rudiment of Allantois. *K*, Yelk-sac. *L*, Entodermic Layer. *M*, Vessels. (PETERSON.)

wider at the anterior than the posterior, and about its center shows a darker spot that marks a close and permanent union of the two layers. From this spot a dark streak is seen extending backwards to the outside of the shield. This is the primitive groove or streak, which gradually deepens by a heaping up of the sides.

At about the time of the appearance of the primitive trace there is seen a new layer of cells between the ectoderm and endoderm layers, known as the mesoderm or mesoblast. This appears to be formed

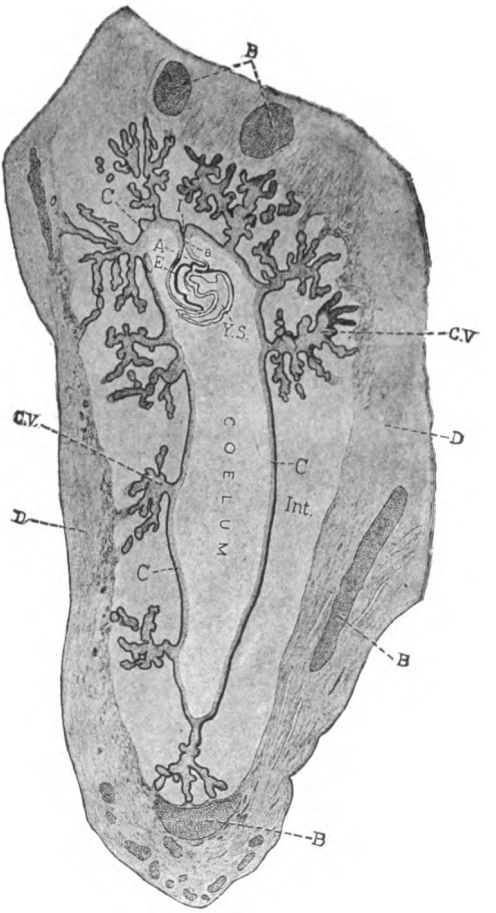


Fig. 17.—Section through Young Ovum of Hylobates, Showing Formation of Amnion. *A*, Amnion. *a*, Amniotic Pedicle. *B*, Blood-vessel. *C*, Chorion. *CV*, Chorionic Villi. *D*, Decidua. *E*, Embryo. *I*, Point of Inversion of Blastodermic Vesicle. *Int*, Intervillous Space. *YS*, Yelk-sac. (SELENKA.)

from the endoderm by a process of delamination. It is first seen at the periphery of the primitive streak, and as it grows outward it divides into two layers: an upper or somatopleural and a lower or

splanchnopleural layer. The mesoderm of primates grows with great rapidity with reference to the rest of the embryonic cells; this must be kept in mind. At this stage a cross-section would show the germinal area to be the mass of cells in the center of which the embryo develops. Below is the yelk-sac, and at its edges can be seen the three primitive layers of cells. The anlage of the embryo then is the primitive streak.

The somatopleura, composed of ectoderm and mesoderm tissue, grows out from all sides of the trace and turns upward, the splanchnopleura at the same time turning downward around the endoderm and surrounding the mass of egg-substance of yelk-sac. The somatopleura grows much faster, and much more rapidly in front than behind, and the embryo seems to sink into the body of the egg, being held in place by its posterior attachment to the ectodermic layer under the zona. The result is soon an embryo covered over by a fold having ectoderm interior and mesoderm exterior, and attached behind by ectoderm to the outside. When the overlapping layers come together they unite or fuse, and the resulting cavity is the amniotic; and the amniotic membrane is composed of ectoderm internally and mesoderm externally. This last is attached to the sides of the embryo, and to the abdominal stalk or "bauchstiel" behind. Meanwhile the splanchnopleura has surrounded the yelk-sac, which has, therefore, hypoblast interior and mesoblast exterior.

The yelk-sac is now being rapidly absorbed, while the amnion is as rapidly growing. The approximated layers of mesoderm fuse and the cavity extends clear around the embryo, sac and all, except at the bauchstiel, where it is stopped. This latter, then, is composed of the trace of ectoderm continuous with that entering into the formation of the primitive trace, the yelk-sac now small and compressed, the rudimentary allantois, while its mass is composed of mesoderm. The allantois is of great importance in some species, but is of nothing more than passing interest in primates. It is a backward development of the posterior body cavity or hindgut, and composed of all three body-layers. At birth traces of it may be seen as a long streak in the cord. It does not, as once thought, enter into the formation of any of the membranes. The bauchstiel has but to lengthen and the amniotic cavity enlarge to form the umbilical cord, and it remains to the end as it was in the beginning, the connection of the embryo to the outside. The peculiarity mentioned that exists in the primates, the enormous and exceedingly rapid growth of the mesoderm compared to the other germ layers, up to the time that per-

manent attachment is made to the uterus, is the cause of the peculiar condition. The cord being a growth of the bauchstiel inside of the amnion, it is not covered by that membrane, which ends at the placenta. All trace of the ectodermal connection of the embryo to the ectoderma of the chorion is lost and disappears when the cord is formed.

The yelk-sac in animals is of relatively little importance, being only sufficient to nourish the embryo until attachment to the womb can be made. The absorption of its nutriment is by the endodermal cells. In the mesoderm around it are first seen the vessels, and from it to the embryo is the first circulation.

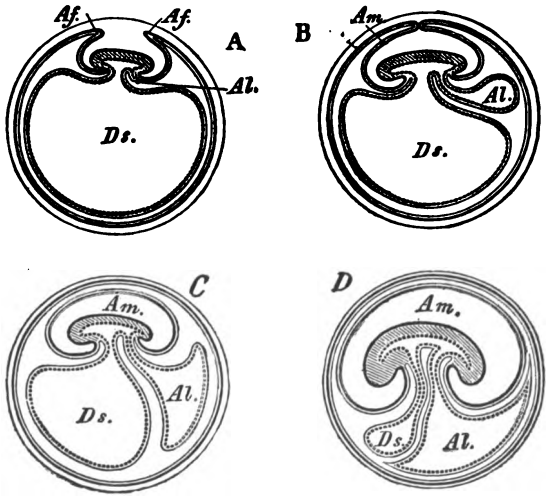


Fig. 18.—Formation of the Amniotic Cavity. (Diagrammatic.)

The cells of the endoderm can be divided into three regions. The first is a simple layer of cells nearly free from all nutriment granules, and from its transparency termed the area pellucida. Around this is the area opaca, darker in color, where the cells are more columnar in shape, with large nuclei and nucleoli. In them are to be seen many food-granules. External to this is the area vitellina, the largest in area, where the cells are crowded with food. They mark stages of absorption: in the area pellucida it is over, in the opaca it is actively progressing, and in the vitellina it is in preparation. Since it is in the area opaca that absorption is most active, it is here that the blood-vessels first appear. In primates degenera-

tion follows very quickly upon absorption of the yelk. In them the embryo is as large as the whole sac by the third week, and the closing abdominal plates have almost occluded it at the umbilicus.

The growth of the embryo takes place by the increase of cells at a given point, their enlargement or their flattening out. In embryonic life growth is usually by an increase of cells at certain points; later, it is by their growth, and in adult life largely by a flattening. It seems to be a law that the ratio of surface is but little disturbed, even if it be not invariable, and is one of the great forces of development. As the size increases, to adjust this the surface must increase, and it can only do so by forming protuberances or

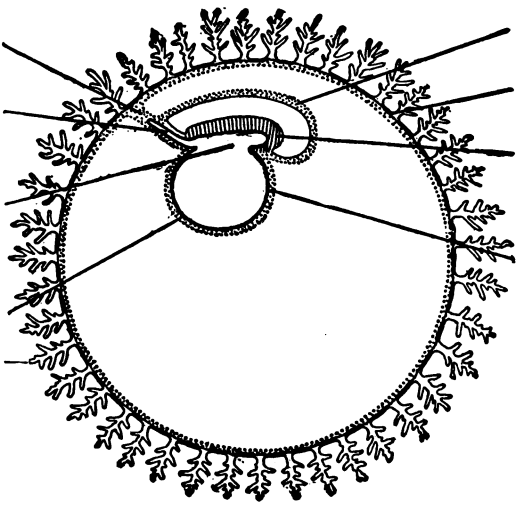


Fig. 19.—Early Stage of a Primitive Embryo.

indentations. The cells bud out thus to form the limbs, and the epithelium turns in to form the glands.

The body as a whole may be likened to two tubes, the inner one being the intestine, the outer the skin. The union of the two at either end forms the cavity later divided into the pericardium, pleura, and peritoneum

Broadly speaking, the common features of any vertebrate show first, then those of the species, and lastly those of the individual; but this is only in a very general way. The human embryo is closest to the embryo of the ape; yet it is different, and that difference is from the start. It is not true that the embryo passes through the steps of

all the preceding forms of life, for each develops on its own lines and the similarity is more apparent than real.

Every cell in the body has a life history. At first undifferentiated, it becomes so, degenerates, and dies. The ovum is undifferentiated and consequently homogeneous. Any part of its first division could develop into any organ or part. It is therefore termed isotrophic, and its future is potential only. Development is in large part, if not wholly, the result of mechanical force. Every division of the ovum is a step towards specialization, and with this there is a proportionate loss of the power of alteration or change. When first divided, either cell has the possibility of becoming in its descendants any tissue of the body, but this is soon lost and the cell must then fulfill its destiny. When elaborated it cannot change. This is the law of genetic restriction. The lobster can grow a new claw, because it is low down in the scale of evolution. A cut-off portion of a hydra will become a perfect adult, because it is still lower.

Minot has pointed out that there are two types of differentiation. In one the cells are at once and as a whole developed into special tissue; and in the other, part proceeds to specialize, while part, remaining embryonic in character, reproduce like tissue, which in turn develops. The developed cell cannot revert; its only fate is to die. Epithelioma is not a degeneration of cells, but an over and erratic growth of those existing. Development and death go side by side, the body constantly replacing itself, just as the cells are constantly replacing their constituents, while life exists. Life is an ever-present and continued death.

The human ovum is holoblastic in common with all placental animals, that is, its yelk is only sufficient for nutrition of the embryo until union can be established with the maternal circulation. This being the first great need of the fœtus and it being a function of the mesoderm, we find, what we should expect, that this tissue develops early, is large in amount, and the most rapid in its growth of all the primitive layers. The three layers have well-defined functions, which eventually become special organs for these purposes. The ectoderm is concerned with sensation and protection; the endoderm, with absorption; the mesoderm, with the mass of the body, excretion, motion, and circulation. Ectoderm tissue is therefore several cells in thickness, endoderm is of but a single layer, while mesoderm cells are piled up in masses or detached to form tissues. The whole study of embryology is a following up of these layers and their ultimate ending in adult tissue. It illuminates physiology and anatomy and often

gives the true insight into pathology. The cells of the three layers are not interchangeable. When the embryo is thus far advanced, these tissues are fixed.

The ectoderm forms the epidermis and appendages to the skin, the epithelium of the sense-organs, the brain and nervous system, and the epithelium of the chorion, placenta, and amnion.

The endoderm forms the whole of the digestive tract, bladder, yelk-sac, respiratory system, and the thyroid, thymus, tonsils, and parathyroid glands.

The mesoderm forms the supporting, muscular, and circulatory systems, the epithelium of the peritoneal, pleural, and pericardial cavities, and the genital and urinary organs.

But a small part of the mesoderm actually enters into the formation of the embryo; the rest is used up in the extrafœtal parts. The splanchnopleural cells are very early changed. The cells arrange

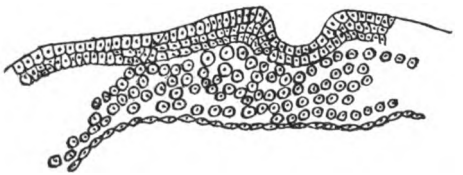


Fig. 20.—Cross-section of Chick Embryo, Showing Three Primitive Layers. (MANTON.)

themselves into tubes and form the walls of circulation canals. Certain other cells are free in these canals and are the anlages of the red blood-corpuscles. With the absorption of the yelk-sac the splanchnopleura is lost, save these cells and the walls of the blood-vessels. The mesoderm of the amnion contains striped muscle-cells, according to Professor Rabl, of Vienna, and therefore nerves or at least irritability. Very early in birds can be seen a rhythmical contraction. At this time there is an opening between amnion and yelk-cavity by way of the neural canal, and it serves to circulate the fluid as a primitive heart to and fro in and among the cells. When the connection between mother and child is formed by the cord, this function of the amnion is lost and the pavement epithelium of the epiblastic portion secreting the amniotic fluid alone is left.

When the cells at either side of the primitive trace have heaped up and are closing over, there is formed at the same time a tube in the endoderm in very much the same way, known as the notochordal canal or chorda dorsalis. This is in the median line and is the axis

of the embryo. At the cephalic end it ends in a blind pouch, and behind, at a point supposed to be identical with the primitive spot or "node of Hensen," where there is an opening upwards through the ectoderm into the amniotic cavity. The opening is termed the blastopore, and through it the fluid is kept moving by the pulsations of the amnion wall. The cells lining the notochord are compressed and elongated and lie at right angles to the axis. The notochord is one of the easily recognized early structures. The next step is for the ventral wall to disappear, leaving the canal in direct communication for its whole course with the yelk-sac below and with the amnion above, through the blastopore. The walls of the canal are now continuous with the endoderm. The notochord at this stage is a rod or band of endodermal tissue running the length of the embryo in the median line and extending from pituitary body to caudal tip under, and in contact with, the floor of the neural canal. It is present before the medullary groove has shown in its whole length. It develops from the front backward. Meanwhile the heart is evolved and the blood-vessels formed, so that early we see two aortæ upon cross-section lying on either side almost with the formation of the notochord.

The fate of this structure is to be divided up into segments by growths of the mesoderm, which then join each other across the median line between these sections and enclose each segment of the notochord. From the mesoderm between these segments are formed the vertebræ, and the notochordial cells can be seen in the intervertebral discs as late as young adult life. These segments are thirty-three in number or more, and first show at the sharp bend of the axis, that is the anlage of the neck. Anterior to this there is always a fixed number of three segments. Segmentation proceeds backward and forward from this point, and is present even before the medullary canal is closed and while that process is going on.

The segmenting mass of mesoderm is triangular in shape, with its base at the medullary groove and notochord, and with its apex divided into the somatopleura and splanchnopleura. The apex now lengthens out or elongates, and is called the intermediary cell-mass or nephrotome. When well marked there appears a duct just external to it, the duct of Wolffius, and just internal a blood-vessel. A little later the intermediary cell-mass is a cord of tissue with a lumen in its center, and is termed the Wolffian body. The triangular mass of cells from which the Wolffian body or ridge is separated becomes muscle-plates, each segment having a vein, artery, cartilage, and muscle-center.

The first vessels appear in the splanchnopleura and are canals among the cells. The point where they are first seen is external to the embryonic area at the circumference of the germinal area called the area vasculosa. This is in the area opaca, where the cells are most actively absorbing the food stored up in the yelk-sac. Artery, vein, and capillary are alike, the differences at any time being more apparent than histological. The lining cells of the canal are the only true part of a blood-vessel; all the rest is but an addition of the mesoderm. Very early these cells contract and dilate, starting currents in the fluids, long before the heart can be determined. Budding processes from these canals are sent out, become hollow, and result in a ramifying system of capillaries around and over the yelk-sac. Their growth is inward toward the embryo from the area vasculosa. Meanwhile there has been developing within the embryo a system of vessels. During this time the embryo has been rapidly growing and lengthening into the "canoe" shape, particularly well marked at the cephalic end. Here, at the anlage of the neck, the axis makes a sharp bend, forming a pouch. This is closed in by the downward growth of the cœlum, which, uniting below, forms the pericardial sac, and the mesodermal cells immediately external to it form the cardiac muscles. From the heart, by canalization, two aortæ each, dorsal and ventral, run out.

From the area vasculosa two pairs of vessels, then, are seen to run on well-defined lines. One follows the splanchnopleural wall to the posterior of the heart; the other, following the somatopleura on either side until the under side of the notochord is reached, there unites with its fellow into the anlage of the abdominal aorta and joins the anterior of the heart. When the branches from the vascular area are united to this the system is complete. The arrangement of the vascular system in the chicken is complete, but that of the mammal is very unsettled, and that of the primates is unknown. The general arrangement is for a vessel to surround entirely the area vasculosa, the sinus terminalis, which sends two omphalomesaraic vessels to the embryo. These, at the embryo, change their name to the sinus venosus, and into them empty the veins of the body wall. Leaving by the double aortæ, the blood flows through a series of arches on either side down to the abdominal aorta, which at or just before its exit from the body divides into two vessels running out to the capillary system and again joins the sinus terminalis.

Very early there are clear, granulated, and nucleated cells in the

blood-stream, but before fœtal life is over they are identical with the red cells in the adult.

The origin of the leucocytes is unknown. They appear much later than the red cells, not until the embryo is well differentiated in all its organs, from some of which the white cell no doubt originates. Nor is anything known of the other constituents of the blood.

Three or four days after impregnation the ovum reaches the uterus and buries itself in the mucosa against the muscularis by a cytolytic or digestive action of the chorion cells. The ovum develops on its surface very early a layer of cells (to which the term trophoblast has been given), which erode the wall and then degenerate, leaving spaces that persist as intervillous spaces in the placenta. It was once thought that the ovum lodged in a fold of the membrane, and a portion of the decidua, known as the decidua serotina, remained between the chorion and muscle. Section of Peter's ovum shows this not to be the case, and the name decidua serotina simply persists as that part of the wall where the placenta is attached. Chorionic attachment and nourishment last until the formation and attachment of the placenta, at about the third month, when true parasitic growth begins. The trophoblast, then, is a term applied to the outer layer of the epiblast, and is thought to surround only that part of the ovum which is in contact with the uterine wall; or if it does, that the layer is early lost elsewhere. These cells have the special function of eroding the maternal tissues, that the ovum may be imbedded in its substance. These cells cover the villi of the chorion, and at the placental site, where fully developed, consist of two layers. The basic layer is of large and conspicuous cells, dark in color and with large nuclei arranged in a single layer and called Langham's cells. The outer, or syncytium, is a mass of smaller cells, that multiply beyond the ovum and extend well out into the maternal tissue with the definite function of digesting all tissue they come in contact with. These, opening up blood-vessels, form large blood-spaces connected with the arterioles of the mother. While the syncytium is thus forming blood-sinuses in the mother, the villi of the chorion, mesoderm covered by ectoderm, is budding into these spaces, each bud covered by a layer of Langham cells. The syncytium cells are fated to disappear with the formation of the spaces. Langham's layer seems to have some function that calls for its persistence a little longer, but it is not permanent; isolated cells may be seen in the placenta at birth. This latter probably absorbs food directly until the fœtal blood-vessels have reached the placenta. The chorionic villi

grow out into the spaces and branch, having in each an artery and vein. These are branches of the two dorsal aortæ running backward into the bauchstiel. This type of circulation increases with the shrinking of the yelk-sac. The cells of the villi that separate the two streams of blood are of ectodermic origin. Into them must pass the nourishment for the fœtus, even if there be not an elaboration of this substance in the cell itself. So, also, the excretion of the child must pass through these cells before it can reach the mother. It is analogous to the condition in the lung, where a layer of cells separates air from blood. These cells are a part of those that enter into the formation of the embryo, and therefore have the same needs as the embryo. Taking the food of their own kind and discharging the surplus into the fœtal blood-stream is the basis of fœtal nutrition. These cells have a selective action. Substances that are detrimental to the embryo are not easily passed through; yet they do pass, and

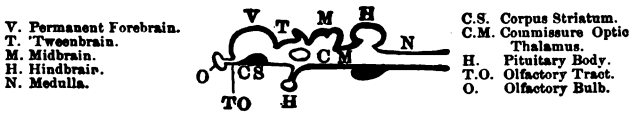


Fig. 21.—Formation of the Primitive Brain. (MANTON.)

the fœtus is subject to all the exanthemata attacking the mother, though that germs of any kind actually pass is a disputed point.

When the primitive streak has deepened and nearly reached the notochord, it is closed over the top to form the canal by the medullary plate. This plate develops backward, even over the primitive knot, and is considerably wider than the canal and rounded at both ends. It at first shades into the ectoderm of the area germinitiva, but soon is separated by a well-defined piling up of the cells from that surface. As it closes over the blastopore there is some doubt as to whether it closes that opening. Such an opening is usually thought to persist and is termed the neurentic canal, and is shown in wax models of human embryos. The heaped-up walls enclosing the canal do so first at a point which is the anlage of the neck, and from there extend both ways. The last point to be closed is in front, which may persist for some time, and is termed the anterior neuropore. Roughly speaking, the anterior half of this canal is the future brain; the posterior, the spinal cord. The cephalic end of the canal widens out rapidly, and by two constrictions is divided into three cavities or lateral pouches on either side, the posterior one tapering back to the

caliber of the cord. The lateral pouches are the fore, mid, and hind-brain. The caudal or spinal end of the canal is compressed and the sides thickened until the lumen appears as a vertical slit. The wall-cells are nucleated and radially placed. This, with the solid notochord touching it below, is a very conspicuous landmark in any early slide. It soon gains the appearance of two thick, upright columns of cells, on cross-section, covered over by a thin plate of tissue and closed below by another thin plate. The two lateral columns of cells are differentiated into a dorsal and ventral band of tissue. In the brain they become much modified, but the six sets in the cord—the dorsal and ventral plates and the two dorsal and ventral bands of the lateral columns—are the anlages of the cross-tracts and the anterior and posterior columns of the cord.

The origin of the nerves is unknown, but they are thought to be a direct outgrowth from the axis cylinder, while the supporting structure is of mesodermic tissue. The other theory advanced is that certain cells unite, end for end, their nuclei becoming the neurolemma.

The walls of the forebrain, which is the anlage of the third ventricle, develop into important structures. From its fore part two buds are the optical vesicles, destined to be the optic globe and nerve. In the roof is the pineal gland, the anlage of an undeveloped median eye. The pituitary body develops from the floor, and from the upper and fore part pouch out the cerebral vesicles, the lateral walls of which are the anlages of the corpus striatum. The whole cerebrum is a development of this forebrain and its pouches.

The midbrain is the anlage of the aqueduct of Sylvius. From its roof is developed the corpora quadrigemina, and from its floor and walls the tegmentum and cruræ cerebri.

The hindbrain becomes the cerebellum, medulla, and pons, its cavity being the fourth ventricle. The ventral plate of this is the origin of all the spinal nerves.

The body cavity, or splanchnocele, lies between the two layers of the mesoderm upon its division. This space is the anlage of the pleura, peritoneum, and peritoneal cavities. The pericardium seems to be first formed by a downward growth of the mesoderm towards the sharply bent-over head. These, before uniting, form a space around the heart, lying below the anlage of the pharynx. The next step is an ingrowth of the splanchnopleura carrying the vessels to the heart and just posterior to that organ. This is the septum transversum, the anlage of the diaphragm. This septum forms a cavity above and behind the pericardium, the pleura; and a larger one be-

low, the abdominal cavity. When the ventral plates close to the umbilicus they are complete. The mesodermic cells lining it soon acquire the character of the ependyma of the peritoneum. At first this may be likened to a cylinder drawn over the intestinal tube and closed at each end. This simple arrangement is now to be considered complicated by the growth and development of organs from the mesoderm external to it. As the digestive organs develop they jut in until the complicated condition of the adult is reached, where the peritoneum covers and suspends the abdominal organs. Also the intestinal tube lengthens and becomes convoluted.

When the meseraic veins run in to the heart, carrying with them the septum transversum, it closes until it reaches the endodermic canal of the head. It is from this endoderm that, just posterior to the septum, a group of cells accumulate as the anlage of the liver. These cells and the omphalo-mesenteric veins are intimately blended, the cells arranging themselves around the branches of the veins as the systems of the liver or hepatic cylinders. The liver is relatively very large in all embryos, and must play a very important part in its life, more so than in the adult.

The Wolffian body is the origin of the kidney in part. The Wolffian body is made up of lateral tubules at right angles to the body and duct. The duct opens into the cloaca in common with the rectum, the allantois, and its fellow-duct. At the termination of each tubule is a glomerulus, apparently identical with those of an adult kidney, secreting urine. The Wolffian body reaches its development at the second month, and by the third has been superseded by the true kidney. It extends on either side from the septum to the cloaca. Parallel and just internal to it is the genital ridge, with its duct of Müller. Most of the cell-mass of the primitive segments enter into the Wolffian body, about two tubules corresponding to each segment. The body is fated to be divided into three organs. The anterior portion, the pronephros, is lost. The middle portion forms the genital gland, and the posterior or metanephros, the kidney. The fate of the duct is not the same in the two sexes. In the female it becomes vestigial, but may be traced through the wall of the uterus and below as the duct of Gartner, while the tubules are the paroöphoron, the genital portion persisting as the opoöphoron. In the male the duct forms the epididymis, the vas deferens, and the ejaculatory duct. The tubules of the genital portion are the vasa deferentia. Only in the male does the duct persist. The cortex of the permanent kidney starts as a bud where the duct opens into the

cloaca, from where the cells reach out and cover over the lower third of the Wolffian body. The ureter is the result of the growth of the body and lifting up of the kidney.

The duct of Müller is developed on the outer side of the Wolffian ridge, just below that duct, by an infolding of the cœlom wall. Its cephalic end is open to the cavity, while below it is fused to its fellows and opens into the cloaca. By the third month part lies in the Wolffian ridge and part in the genital cord, which is the union of the Wolffian body, duct, and Müller's duct. In the female this lower fused portion is the anlage of the uterus, and the upper part of the Fallopian tubes. In the male they are the sinus pocularis.

The vagina is the downgrowth of the mesoderm from the fused end of Müller's duct in the genital cord, and the lumen is formed by a canalization of its center.

That portion of the allantois remaining within the closed cavity of the abdomen forms the bladder and urachus. The lower part, opening into the cloaca, sacculates and is afterwards joined by the ureters. The part above is the impervious cord of the urachus.

The pharynx is formed in a complicated manner. Four pairs of buds grow down just in front of the sharp curve which is the anlage of the neck. Each of these is hollow. The processes, numbered from the front, are the anlages of important structures and determine the branching and grouping of arteries and nerves. These four arches appear about the fourth week and are lined by the foregut, the walls of which they assist in forming, and at each cleft, therefore, there is a union of ectoderm and endoderm. The first arch is the mandibular, the second the hyoid, the third and fourth brachial. Each arch contains an artery, vein, cartilage, nerve, and muscle anlage. Not all of these elements are to be permanent. The mandibular retains the cartilage, artery, and vein only, for example. The cleft between the first and second part is in part the external auditory meatus. The nerves to them are as follows: the third branch of the facial to the first arch; the eighth, to the second; the glossopharyngeal, to the third; the superior laryngeal, to the fourth; to the fifth and sixth, in man rudimentary, but well-marked in the fishes, the inferior laryngeal. Each nerve supplies the muscles of its own arch and the cleft in front of it. At this time the embryo has two dorsal and ventral aortæ, joined together by branches. These six branches loop up from the ventral to join the dorsal aortæ, run in the arches, and join the dorsal aortæ, which later unite into one and enter the heart. The common carotids are the ventral aortæ. The

first and second brachial branches are lost, but the opposing branches that run downward are the facial and linguals. The third is the first part of the internal carotid and ventrically the superior thyroid. The fourth is the subclavian on the right side and the arch of the

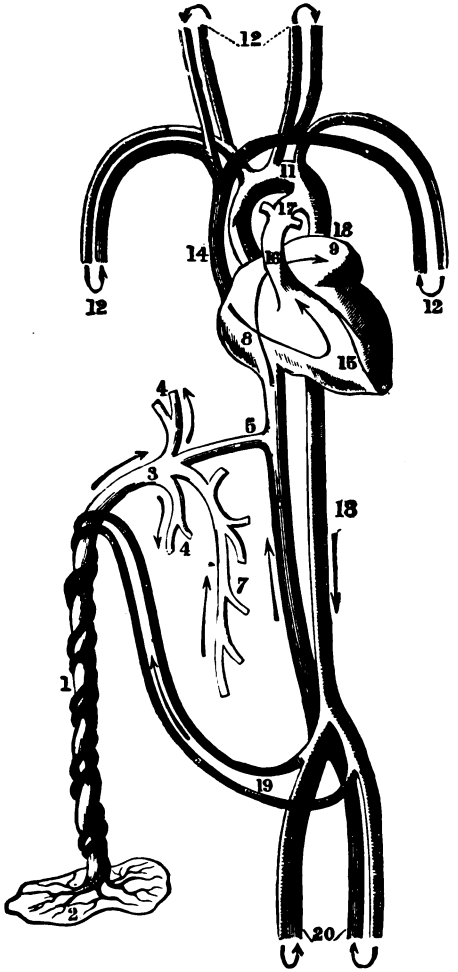


Fig. 22.—Diagram of Fœtal Circulation. *1*, Umbilical Cord, with Veins and Arteries. *2*, Placenta. *3*, Divisions of Umbilical Vein. *4*, Hepatic Branches. *5*, Ductus Venosus. *6*, Inferior Vena Cava. *7*, Portal Vein. *8*, Right Auricle. *9*, Left Auricle. *10*, Left Ventricle. *11*, Arch of Aorta. *14*, Superior Vena Cava. *15*, Right Ventricle. *16*, Pulmonary Artery. *17*, Ductus Arteriosus. *18*, Descending Aorta. *19*, Umbilical Arteries. (YOUNG.)

aorta on the left. The right dorsal aorta is lost, except for the upper part of the external carotid above and below the superior intercostal downward from the fourth arch. Vestigial remains of the ventral aortæ are the common carotid and innominate arteries. The structures developed from the floor of the pharynx are the tongue between the first three arches; the tonsil is the second cleft; the thymus is the third cleft; and the thyroid is the fourth cleft.

The limbs appear as buds at the end of the third week. They are flat processes with an extensor and flexor surface. They spring from a lateral ridge of the somatopleura as outgrowths from the body-wall. Opposite to each limb are seven of the primitive segments, and to each they send seven elementary arteries and veins, nerves, etc. By the fifth week constrictions mark the location of the joints. Differentiation extends from the periphery outward.

HEREDITY.

As to what sexuality is or what is male and female, the theory of Minot alone seems to explain. He takes the ground that the union of the male and female elements produces a hermaphroditic or non-sexual cell. This cell can reproduce by division only, and each part must be an exact copy of its parent. That the cell, by extruding chromatin in the polar globules, gets rid of its male element and the remainder is purely female. In the same way, the chromatin of one of the second generation of cells from a spermatid will become a spermatozoön. The ovum is asexual until the extrusion of its polar globules, and sexuality is a relationship; exactly what, we do not know. It resides in the nucleus of the cell, whereas irritability, contractility, etc., have their site in the protoplasm. The two sex-cells are not alike. Originally identical, the one is stored with food or energy, the other with chromatin or energizing principles. The work of Professor Jacques Loeb has shown that the essential factor of the male in fertilization is a chemical one that can within certain limits be duplicated. The lower the scale of life, the less do the sex-cells differ. The more dissimilar the cell, the more the whole body enters into sex differences, to produce and favor the union of the sex products and to protect the result until maturity.

When two cells of algæ sexually unite by conjugation there are no differences in the cells, and they do so because they are of the right stage and sufficiently stored with food. When a higher type is reached we see one cell containing the food for division and the other the exciter to division, and with this the whole individual, even to

special organs, modified for the sole purpose of appealing to every sense that will promote the sex union. As to why this is needed we can only guess. Every cell must sooner or later die, and this because it can no longer adjust itself to outside influences. The forces in the cell will no longer react in their present combination. To perpetuate the species there is needed a new cell with these forces drawn from different sources. Inbreeding will result in deformity or the loss of the power to reach full development; crossing will produce a more vigorous stock. It also equalizes the varial tendencies, until the race as a whole alters as a real adaptation to environment. Where species have been geographically isolated wide variation will come in time, but only what conserves the whole. Sporadic variation is both checked and forced on the race, according to the needs of the whole, by sexual union.

Now, as mentioned, differentiation is of two types; one of the cells as a whole, and the other where part only is changed while the remainder continue to stay embryonic, in turn developing. Theories of heredity are based on this. Not all of the cells of the segmenting ovum develop into the embryo or its membranes. Part of these cells remain unchanged and are enveloped and included in the future genital organs. The descendants of these cells are the ova and the spermatozoa, a part of and yet not peculiar to the individual itself, but, as it were, a portion of the whole human race. This holds the species free from variation and all the individuals in it identical. Now, on the other hand, the individual all his life tends to alter his surroundings—to yield to outside influences or react to external stimulation. The germinal cells are the original embryonic tissue, but do not develop or prepare for future sexual development until the individual is an adult and has modified or varied about all it will. Every individual has apparently the power to add to the germinal cell the result of his own variation in proportion to the need for this change. Were the individual to have the power to transmit his variation uncontrolled by the tendency to follow race lines, a few generations would see a new species for every individual. All this is altered when the two factors are united, and again when another individual is required. Only the common and therefore the needed variation will be in force, the rest being neutralized. The offspring is thus held true to the prototype. The modification by the individual or formative influence of the adult on the enclosed germ cell, persists forever; it is a permanent impression on the race. If unopposed by the uniting cell, or if aided by a like impression, the result will

show in the child. Peculiarities of grandparents are strikingly seen at times, or even long past and forgotten history of the race may repeat itself (atavism) if uncorrected.

It is also fair to assume that this force is not equal in all or any two individuals of the race, and that the offspring will resemble that parent in whom the individualism predominates; also that it varies from time to time in the same person. To the germ-cell, then, is added the whole result of the formative force of the adult body with all its peculiar modifications, and equally in both sexes. The repro-

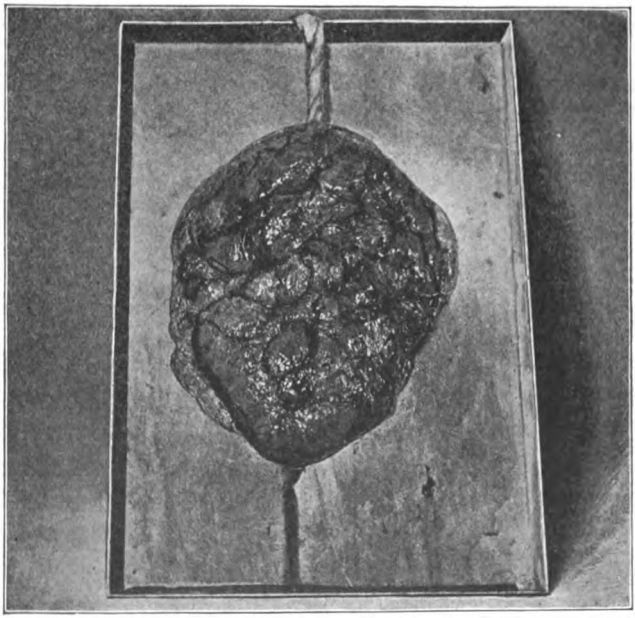


Fig. 23.—The Maternal Surface of the Placenta. (GRANDIN AND JARMAN.)

ductive force lies in the nucleus, and since it is the chromatin in the male that is the essential part, it is likely that this force is there. The chromatin of the male or female cell is identical with that of every cell in their respective bodies. United, they coincide to the race and such variation as is coincident or not opposed.

Germ-cells, or a portion of the original cells of the ovum that do not take part in the development of the embryo, have been traced in animals to their position in the genital epithelium. These are just outside of the embryo until the closure of the abdominal plates,

when they migrate over the wall to a well-defined spot on the mesentery, where later are developed the genital organs. These are reproductive cells inclosed and called the genital epithelium. They multiply slowly, during embryonic life at least, and never unite into tissue, but remain always isolated.

The decidua vera is that hypertrophied membrane of the womb which develops soon after fertilization and extends to the internal os. Hegar and Leopold have shown that it is but a modified endometrium.

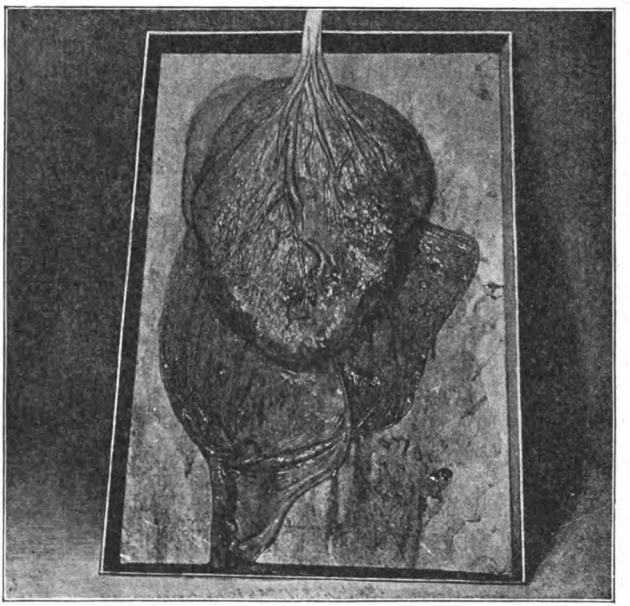


Fig. 24.—The Fœtal Surface and the Membranes of the Placenta. (GRANDIN AND JARMAN.)

The decidua reflexa is that portion of the membrane that has closed over the ovum when it has eroded into the muscle. As the ovum swells, it hypertrophies. During the early months the ovum, covered by decidua reflexa, does not fill the womb, but is a tumor on its surface, and considerable space is between the decidua vera and reflexa. By the third month the embryo has pushed the two decidua together, and they fuse.

The placenta is formed by the union of the decidua with the chorion at the spot where the trophoblast of the chorion eroded its

way under the surface. It is composed of fœtal and maternal structures. The fronds of the chorion, carrying their vessels, project into the maternal intervillous spaces and sini, but at no time is there any connection directly of blood. The two circulations are separated by the vessel-wall and a double layer of chorionic epithelium and the stroma of the villus.

The bulk of the placenta is composed of the mass of villi dipping into the sinuses of maternal blood between the decidua seratina and the chorion itself.

The placenta is the nutritive and respiratory organ of the fœtus. The human placenta is monodiscoid, 15 to 18 centimeters (6 to 7 inches) in diameter, 3 to 4 centimeters (1 to $1^1/_2$ inches) thick, thinner at the edges than at the center, and weighs 500 to 600 grammes, about one-sixth the weight of the fœtus. The uterine surface is roughly divided into fifteen or twenty cotyledons by sulci. The fœtal surface is smooth and continuous with the amnion, which may be peeled off, leaving a granular surface. The cord is normally inserted at the center, but may be on any part. A tendency to polydiscoid or bidiscoid placenta is a reversion to conditions found in animals—anthropoid apes alone of all the vertebrates having a single-disced placenta. This is of interest from the danger of leaving an accessory placenta behind. Examination of the removed portion will show in such a case a large vessel with open mouth at the periphery. Such fragments are foreign bodies in the womb, certain to cause hæmorrhage, or, if retained and organized, will become malignant tumors. Rebemont-Dessaignes reports in the Paris Maternity, 6701 labors with 19 double placentas, one in 352 cases.

The placenta is a highly differentiated tissue that not only allows of osmosis, but it carries on secretion, elaboration, and digestion for the child. Some substances, as opium, mercury, arsenic, and iodine, as well as the toxins of the eruptive fevers, pass readily to the fœtus. It is not proven that it secretes any substance concerned in fœtal metabolism, although a diastatic ferment capable of converting starch, a weak glycolitic ferment, and one akin to trypsin have been found that evidently prepare material for the synthesis of the fœtus.

The umbilical cord, or funis, is the connection from the placenta to the child. It is dull white in color, and carries the two arteries and the one vein of the fœtus. It is about 1 to $1^1/_2$ centimeters ($^1/_2$ inch) in diameter, and its length is 56 centimeters (22 inches), with great variations. A short cord of less than 15 centimeters (9 inches), which is the distance from head to navel, would be a bar to labor,

while lengths of over seventy inches are recorded. It is, except in a very few cases, spirally twisted, and the veins being longer than the cord, and therefore folded, gives rise to a nodular appearance. These are "false knots," in distinction from a "true knot" of the cord, where the fœtus has actually passed through a loop. The cord is often wrapped around parts of the child, especially the neck, and

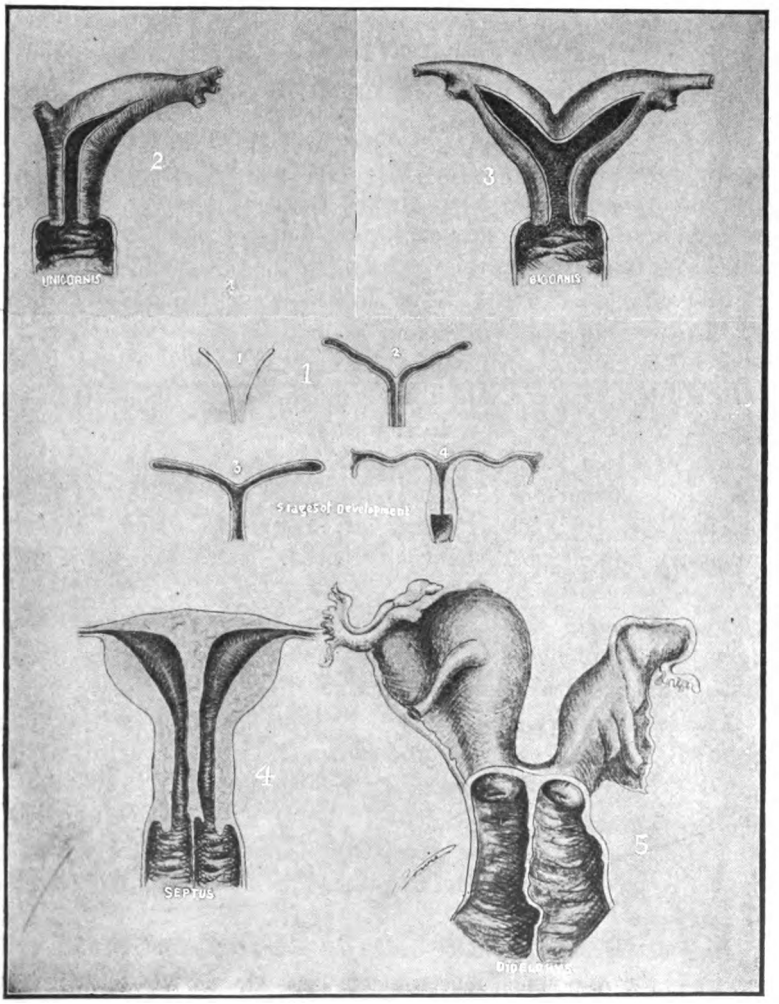


Fig. 25.—Development and Malformations of the Genital Apparatus. *1*, Stages of Development. *2*, Uterus Unicornis. *3*, Uterus Bicornis. *4*, Uterus Septus. *5*, Uterus Duplex. (GILLIAM.)

may thus amputate limbs, or, in the case of twins, if twisted, asphyxiate both. A section of the cord at the umbilicus will show the shrunken remains of the yelk-sac and cells of the allantois. The cord is strong enough to resist considerable force, but has a weak spot a few inches from the navel, so that a child dropped from a few feet will rupture the cord at that point. Nature removes the cord by a line of demarcation at the navel. The weaker the baby, the longer before this takes place.

DEVELOPMENT BY MONTHS (LUNAR).

End of First Month.—The embryo is 1 centimeter ($^1/_3$ inch) long and weighs 20 grains. Head, trunk, and buds of limbs can be seen; all organs, as the heart, lungs, hair, etc., can be recognized. The four brachial clefts are not closed, but the child is practically formed and the rest is development.

End of Second Month.—The mass is about the size of a hen's egg. The embryo is 5 centimeters (2 inches) long, and weighs 350 grains. The chorionic villi have disappeared, except at the future placental site. There is fluid in the amnion, and it is nourished from the mother. Sex alone is indistinguishable.

End of Third Month.—The mass is the size of a goose egg. The embryo is 8 centimeters (3 inches) long; the placenta is 2 by 3 centimeters (1 by $1^1/_2$ inches) and is attached to the womb. The ribs are marked, fingers perfect and not webbed. Sex cannot yet be told. The bronchial clefts are closed.

End of Fourth Month.—Embryo 8 centimeters (3 inches) long, weight 1800 grains, cord is spiral, sex now marked, body has lanigo hairs, and the child will live a short time if born.

End of Fifth Month.—Embryo 20 centimeters (8 inches) long, weight 4100 grains, cord 30 centimeters (12 inches) long. Quickening has occurred, and if born it tries to breathe. The skin is wrinkled, eyes open.

End of Sixth Month.—Embryo 30 centimeters (12 inches) long, weight $1^1/_2$ pounds. Some fat is present, hair on head, will breathe and live some hours.

End of Seventh Month.—Embryo 38 centimeters (15 inches) long, weight $2^1/_2$ pounds, meconium is present. It will breathe and perhaps live.

End of Eighth Month.—Embryo 40 centimeters (16 inches) long, weight $3^1/_2$ pounds. There is considerable fat. The lower epi-

physis of the femur is ossified, one testicle is down. The child will live with care.

End of Ninth Month.—Embryo 43 centimeters (17 inches) long, weight $5^1/_2$ pounds, quite fat, nails not yet to finger ends. With care it will live.

End of Tenth Month (Birth).—Embryo 51 centimeters (20 inches) long, weight 7 pounds, nails even with fingers, skin pink, cuboid center just ossifying.

At birth all the ductless glands are larger relatively than in adults.

To determine the age of a fœtus there is a quick rule based on the length. At one month (4 weeks) it is 1 centimeter; second month (8 weeks), it is 4 centimeters; third month (12 weeks), 9 centimeters, or the square root of the length in centimeters is equal to the age in months. This will hold good up to the fifth month, when the length in centimeters divided by five will give the age closer.

THE CHILD AT BIRTH.

No sign alone determines a child's maturity and fitness for extrauterine existence. At 280 days it weighs 3317 to 3459 grammes ($7^1/_3$ to $7^2/_3$ pounds), a vast majority being between the limits of six and nine pounds. Males are a little heavier, and the first child is apt to be lighter than the average of the woman afterwards. This is probably due to the rigid abdominal walls.

The measurements of the average head are first, of the rigid base between the base and points of the yielding vault and between points on the vault.

The bitemporal, *TT,* is taken between the anterior extremities of the two coronal sutures. It is 9 centimeters (3.15 inches).

The biparietal, *BP,* is between the two parietal eminences. It is 8.25 centimeters (3.64 inches).

The occipito-frontal, *OF,* is the greatest distance between the occipital protuberance and the frontal bone. It is 11.75 centimeters (4.56 inches).

The occipito-mental, *OM,* is the greatest distance between the occipital protuberance and the point of the chin, and is the longest diameter possible of the head. It is 13 centimeters (5.12 inches).

The suboccipito-bregmatic, *SOB,* is from just in front of the large fontanelle to the neck behind the foramen magnum. It is 9.5 centimeters (3.75 inches).

The trachello-bregmatic, *TB,* is from the bregma to the neck in front on a level with the chin. It is 9.5 centimeters (4.75 inches).

The bimastoid, *BM,* is between the mastoid processes. It is the width of the base and is 7.5 centimeters (3 inches).

The distance between the malar eminences, *MM,* or bimalar, is also 7.5 centimeters (3 inches).

The fronto-mental, *FM,* from the glabella to the chin, is the long diameter of the face. It is 8.25 centimeters (3.25 inches).

The suboccipito-frontal, *SOF,* from the root of the nose to the neck behind, is 11 centimeters, (4.5 inches).

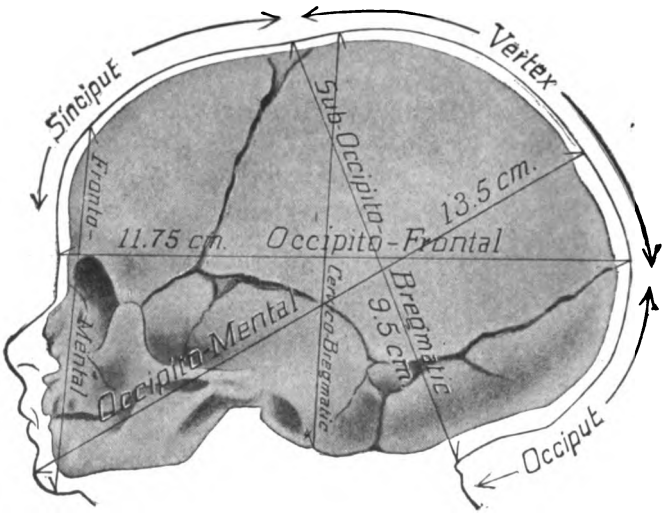


Fig. 26.—Side View of Child's Head at Term, with its Diameters and Measurements. (WILLIAMS.)

The occipito-mental is the longest diameter of the head, but the distance from chin to neck is greater than from occiput to neck. A force acting on the head, therefore, tends to push the longer arm of the lever downward and flex the head to the suboccipito-frontal or shorter measurement, where the leverage is uniform. This mechanism of flexion is very important.

The parietal eminences, forehead and occiput, are bony points where ossification is advanced and at which no moulding can occur. They are the points that are fitted for and must impinge on the pelvic planes of the mother.

The occipito-frontal plane, or cross-section of the head at the

occipito-frontal circumference, is nearly circular. It is 34.5 centimeters (13.58 inches).

The suboccipito-bregmatic plane, or section through the parietal eminences, is nearly circular also, and is the ideal plane at labor for the head to enter the pelvic inlet. It is 30 centimeters (11.8 inches).

The occipito-mental plane of cross-section is oval and the largest of all. It is 37 centimeters (14.5 inches).

The bisachromial plane only becomes of interest after perfora-

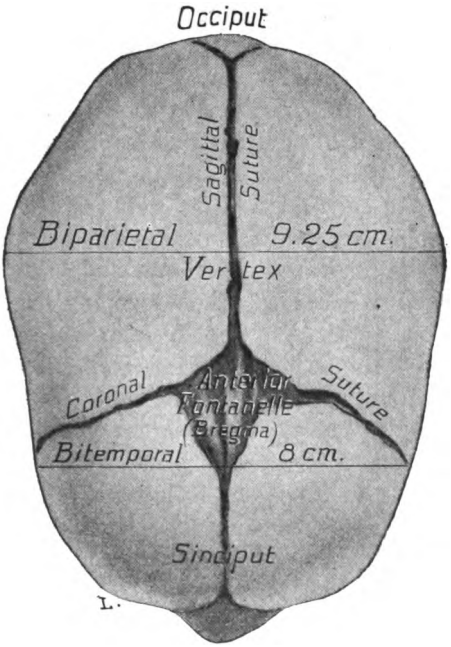


Fig. 27.—Child's Head at Term, Viewed from Above, with Diameters and Measurements. (WILLIAMS.)

tion of the head and in monsters. It is about 34 centimeters in circumference (13 inches). Likewise the bisachromial diameter is 12 centimeters (4.75 inches).

The dorso-sternal diameter is 9 to 9.5 centimeters (3.5 to 3.75 inches), and the bis-iliac diameter is 9.5 to 10 centimeters (3.75 to 4 inches).

As the child lies in the womb, the length of the fœtal ellipse, or the distance from head to breech, is 25 centimeters (9.5 inches). This measurement is of importance in version.

The head is relatively very much larger than in the adult, as is also the liver, which is $^1/_{30}$ its entire weight. Obstetrically, the baby is divided into head and body. The body is easily compressed and rarely causes trouble. The head is not easily altered, the face and base not at all; and where the base or face can pass, the rest of the baby can follow. The moulding of the skull is in the two frontal, two parietal, and occipital bones. These surfaces may be dented in like stiff paper without injuring the brain, which stands much pressure and alteration of shape. Any change short of actually breaking the bones will neither kill the child nor alter its future mentality. The bones of the vault are united by cartilage, and the thin edges of the parietals easily override the occipital and frontal. At the union of the frontal, coronal, and sagittal sutures is the anterior or square fontanelle, soft and easily the first landmark on the presenting fœtal head. It only ossifies months after birth. Not only is the form thus altered, but the cerebral fluid as well as blood to the body is forced into the spine and actual bulk is reduced. At the union of lambdoid and sagittal is the small posterior and triangular fontanelle, which is obliterated in labor by the overlapping bones. Two others on either side exist, but are not readily felt; the anterior lateral at anterior tip of parietal, and posterior lateral at posterior tip of parietal. They are of no diagnostic importance. Occasionally in the line of a suture a small false fontanelle may be present.

The temperature of the fœtus is one degree Fahrenheit above that of the mother, from functional activity which is absorbed by the liquor amnii. The new-born child is richer in red cells than the adult. The body is plump and well-rounded, there are no lanigo hairs, the eyes are open, the vernix in only on backs of hands and flexor surfaces. Miliaria are on the nose, it sucks and cries vigorously, the nails project, cartilage of nose and ears is firm, eyebrows and lashes formed, hair is one inch long on the head, the breasts are large and secrete, and the testicles are in the scrotum. There is a center of ossification in the lower epiphysis of the femur and upper of tibia, the astragalus has a well-defined center, and that of the cuboid joint shows. The baby has very imperfect hearing, but is sensitive to jars. Taste is well developed, also smell. There is appreciation of light at birth, coördination at the sixth week, will follow movements at two months, and perceives colors at three months a little. Will recognize the nurse or mother at about three months. Feeling is very poor. the sense of touch being sensitive to form in the mouth first of all. The muscles act involuntarily. The legs

straighten out about the third week. At four months, it tries to raise its head and has a voluntary grasp. At nine months it can creep; ten and eleven months sits alone; stands at nine months to a year; walks at ten months to fourteen; at sixteen months usually can walk. The head may be flexed until the chin touches the sternum, or extended until the occiput touches the cervical spines, without injury to the neck-muscles, or it may be rotated on the shoulders ninety degrees. Tarnier even says one hundred and eighty.

At birth the stomach is relatively small and intestinal action rapid. Its heat-generating power is almost nothing. It should gain about two-thirds of an ounce per day; but ten days after birth it should weigh the same as at birth, from excretion and loss of meconium. At five months it should have doubled its weight at birth, and three times its birth-weight at one year. At six years it should be twice its length at birth.

CHAPTER IV.

PHYSIOLOGY OF PREGNANCY.

CHANGES IN THE BODY PRODUCED BY PREGNANCY.

THE changes are mostly in the genital organs, but the whole body is affected thereby. There is greater metabolism, in general a condition throughout of hypertrophy and hyperplasia; nowhere is there atrophy.

The vulva is enlarged, veins engorged, secretion more profuse, rugæ more marked, and pigmentation pronounced. During the last months the glands are so active as to give a physiological glandular vaginitis. During the first month or two, while the womb is in the pelvis and pressing down, the vagina is shorter than normal; later it is lengthened. As the vagina lengthens and the womb falls forward against the abdominal walls, the cervix is higher and points more backward and a little to the left, from obliquity of the womb. The canal is broad and patulous.

In the uterus the greatest changes of all naturally take place. Its normal size is at once increased by a hypertrophy of all its parts. This begins at conception and is reflex at first, being also found in extrauterine pregnancy. Its capacity is steadily increased to five hundred and twenty times at birth, while its surface area is increased from about six inches to over three hundred and forty, and its weight from one and a fourth ounces to two pounds. While there is hyperplasia of muscular tissue, there is especially hypertrophy, each muscle-cell increasing.

During the first month it is pyriform, becoming cylindrical and rounder. During the second month and third month it becomes a sphere. During the fourth month it tends to an ovoid with anterior-posterior flattening, most marked at end of fifth month. During the sixth, seventh, and eighth months it becomes egg-shaped. During the ninth month the anterior lower segment is bulging from the settling of the head. It sinks from weight and softening of the support below. The belly is largest at the end of the eighth calendar month. It softens also as pregnancy advances, almost fluctuating at term.

The digestive system is sensitive and food is easily vomited. There are acidity, flatulence, heartburn, etc. Later "longings" for queer diet, and then, as the need comes, a condition of chronic hunger, accompanied by an increased secretion of HCl and pepsin and also motility. This is above normal at the seventh month, and at its height the eighth and ninth months. Parity does not influence this. The bowels are loose from increased peristalsis, later constipated from pressure.

The heart shows left ventricle hypertrophy and is increased in rhythm as well as force. The blood is increased in its watery element, does not coagulate so readily, and is in a condition of hydræmia. The cells are but little changed in amount. This gives a plethora, but a physiological anæmia as well.

Breathing is more rapid and is of the thoracic type. It is also shallow; cough and dyspnœa are frequent. More carbon dioxide is excreted. The urine is increased in amount, and its specific gravity is lower. The chlorides are increased and the phosphates and sulphates, which are used by the child, decreased. There is a tendency to albuminuria, which is found in the majority of cases and is not pathological. The albumin test for eclampsia is therefore valueless.

The nervous system is exalted and the woman emotional even to the point of being hysterical at times. There is increased sensitiveness to light and sound, odors, etc. Many of these are but intensifications of what may be noted at each menstrual period. Her disposition is markedly changed, and it is a critical time for those disposed by heredity to insanity.

The thyroid gland hypertrophies, and, as the skin functionates more, bathing should be oftener and regular. Pigmentation of the abdomen, breasts and vulva is always seen, and chloasma on the forehead is common. Striæ on the abdomen mark its distension and remain permanently as white stars.

The navel remains depressed until about the seventh month, and then pouts until term. On the skin the effect is increased action and pigmentation. There are no eruptions characteristic of pregnancy, but all existing ones tend to pigment.

DIAGNOSIS OF PREGNANCY.

There is no condition more difficult to diagnose, and there is no condition so often mistaken for something else, or overlooked, as pregnancy. And there is no mistake in diagnosis that will injure the physician more. Every married woman will be found in one of

two classes, either dreading pregnancy and in constant fear of it, or ardently hoping to become so; and no woman will be found indifferent. Upon every diagnosis will depend fear or joy, and may involve honor and life. Nor can you trust all the statements made to you, for the patient's mind is inevitably biased by her wishes. It is well to consider every married woman pregnant until proven not to be so.

The signs of pregnancy are divided into two classes: subjective and objective—those appreciated by the woman herself, and those educible by another.

(*A*) *Subjective.*—These are:—

1. Cessation of menstruation.
2. Nausea and vomiting (or "morning sickness").
3. Increased salivation.
4. Flatness of the abdomen.
5. Fullness and tingling of the breasts.
6. Striæ and pigmentation of the breasts.
7. Leucorrhœa.
8. Quickening at four and a half months.
9. Nervous phenomena, vague and peculiar symptoms.
10. Irritable bladder.

(*B*) *Objective.*—These are:—

1. Changes in the face.
2. Changes in the breasts.
3. Progressive changes in the abdomen.
4. Pigmentation of the umbilicus and linea alba.
5. Congestion of vulva and vagina.
6. Palpable Braxton-Hicks contractions.
7. Ballottement.
8. Softening of the cervix.
9. Hegar's sign—a soft lower uterine segment.
10. Fœtal heart and funic snuffle.
11. Placental murmur.
12. Change in the urinary phosphates.
13. Johnson's vaginal rhythmic color changes.
14. Rasch's sign or wave in the liquor amnia.
15. Palpation of the fœtus.

Subjective Symptoms.—1. Menstruation may be suppressed from many causes other than pregnancy, although this is the one great sign first calling the woman's attention to her condition. It may be suppressed by emotion, especially fear, or it may be denied or simu-

lated. It cannot be suppressed without symptoms from taking cold. Suppression is an early and regular sign of failing health, especially phthisis, and may be the result of the change of climate or lactation. The woman may menstruate once slightly after conception, while the ovum is still in the tube.

2. Nausea and vomiting, or "morning sickness," is the next sign the woman has learned to expect. This comes on in the sixth or seventh week and is very constant. It is the result of the increased uterine size pressing upon the nerves. It is not a sure sign, for it is found in any case of pelvic irritation and may even be the result of imagination. It is usually noticed upon arising in the morning, with the added pressure of blood due to the erect position. Sexual intercourse will especially start it. Few pregnant women are free from it in some form, varying from nausea to real distress and vomiting. It will last until the womb rises out of the pelvis. Rest in bed and taking light food before arising will usually act beneficially. Oxalate of cerium is a time-honored remedy, but has been of little service in my hands. This nausea must not be confounded with the more serious condition resulting from a toxæmia of pregnancy, which usually appears in the latter half, but the two shade into each other and any serious vomiting should be carefully looked into.

3. Salivation is often profuse and may last a long time. There is no known reason for it, other than the sympathy of parotid and ovarian organs, as shown by coitus sore throat or change in parotitis from gland to ovary or testicle.

4. Flattening of the abdomen from descent of the womb is a sign too vague to be more than mentioned.

5. Fullness and tingling in the breasts is fairly constant. It is the result of increased blood-supply by reflex irritation. This is met with in any tumor or condition increasing the supply to the womb and pelvis.

6. The breasts early become striated and pigmented, following the increased blood-supply.

7. The pelvic congestion will often result in leucorrhœa in nearly every case, more or less profuse. It has been mistaken for gonorrhœa, and is usually seen in the tubercular or those of poor vitality.

8. The third great sign the woman watches for is quickening, which is about the mid-period—four and a half months. It is a trembling, peculiar feeling, that may cause faintness and collapse in a very nervous woman not expecting it. This will increase in force to a

well-defined kick at term. They are voluntary movements of the fœtus adjusting itself to position, and later on seem to be a form of exercise. They are reflex on the part of the child, being easily elucidated by the cold hand placed on the abdomen, when it becomes an objective sign. The woman should be instructed to note the date of their first appearance, as a check to the time of labor. Intestinal movements have been mistaken for it. Quickening was once thought to mark viability of the child, but this is not so.

9. Alterations in the nervous system change the woman's disposition. She is "high strung," easily faints, or becomes hysterical. She is full-blooded, plethoric, perhaps dizzy, and it often happens that a nervous, irritable woman becomes angelic in temper, and vice versa. This irritability should be impressed upon husband and family. The woman is not in a stable condition, and requires the utmost forbearance and kindness. In the predisposed it may even terminate in mania or melancholia, which is usually transient. The woman, too, often craves most peculiar articles of diet, and within reason her taste may be acceded to, although no harm results from withholding it.

10. The congestion and weight of the womb will cause an irritable bladder, rarely a mild cystitis, until the womb rises up, about the fourth month, and again when it descends in the last few weeks prior to labor.

Some women claim to know when they are impregnated, by their feeling during coitus or soon after. This is probably only due to a more perfect satisfaction, which is equivalent to a greater likelihood of pregnancy. Such statements must be taken "cum grano salis." Again, it is possible for a woman to go to term with her first child and not realize her condition, though instances of such unsophistication must, of course, be exceedingly rare.

Objective Symptoms.—1. The face changes in pregnancy. There is a full, animal, contented look that is more or less noticeable. It will take a good deal of practice to appreciate the facies of pregnancy, nor is it at all reliable, but it will often assist. The bounding pulse suffuses the face and eyes. The eyes may be ringed, and in the last months of pregnancy the forehead may show chloasma spots.

2. The breast changes are also objective in so far as they show enlargement, striæ, prominent and erected nipples. The glands of Montgomery are projecting and large towards the end of term. The colostrum can be pressed out in the later months; this, exuding and

drying, may coat the nipple with branlike flakes, even before expression is possible. The striæ are due to hypertrophic acini of the gland showing through the skin and are seen in the first few months.

3. Very diagnostic is the progressive enlargement of the womb. During the first three months it is in the pelvis by its weight, pressing on the bladder. At the third month it is on a level with the top of the symphysis, and from that on steadily rises until it reaches

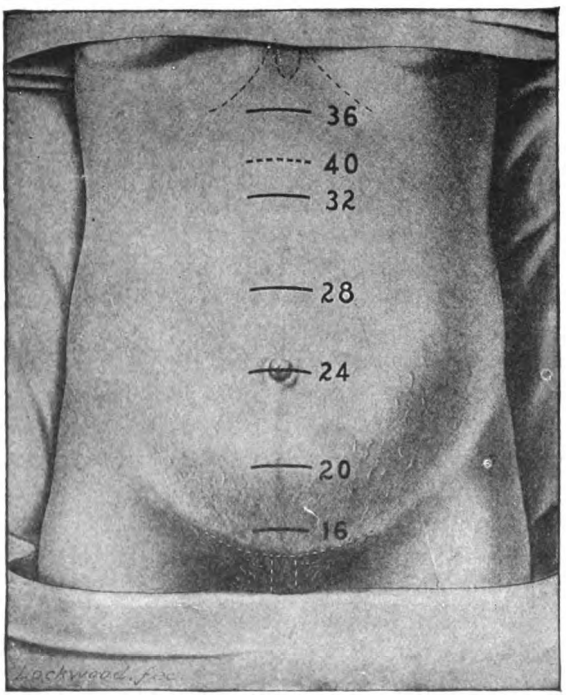


Fig. 29.—Relative Height of the Fundus at the Various Weeks of Pregnancy. (WILLIAMS.)

the epigastrium at the beginning of the last month, when it sinks half way down to the umbilicus, while the pressure symptoms recur. A pregnant womb is a pyriform, unilateral tumor, fast below and movable above, arising in the abdomen about two fingers' breadths each month. Bimanual examination will show that it is the womb or connected with it. Tumors of the womb might give all the congestive symptoms of pregnancy, but it would be in the face of all probability to have a tumor increase regularly and progressively as

a pregnant womb month by month and remain equilateral. After the fifth month the heart and movement of the child could always be obtained.

4. With the abdominal distension the umbilicus pouts out and the linea alba becomes pigmented—the linea nigra. This is more marked in brunettes, but traces of it always can be seen. It is more noticeable below the navel, but may reach from pubes to ensiform. At the same time the skin is marked by oval, reddish spots more noticeable in the flanks, due to minute hæmorrhages in the overstretched skin. These are about 1 centimeter ($^2/_5$ inch) long by half as wide, with their long axis lengthwise. They are more marked in primiparæ. During the puerperium they are absorbed, leaving a white cicatrix that is permanent and a puckered, mottled look to the skin. It is often possible to determine by them the fact of previous pregnancy, or at least great abdominal distension.

5. Jacquemier's sign. As early as the fourth week, or earlier, the pressure of the womb has caused a congestion of the vulva and vagina. Its intensity depends upon the complexion. It is darkest around the urethral orifice.

Alexander's sign is given to a pulsation of the vaginal vessels not normally felt. To the finger the vagina also seems hotter than normal.

Both of these signs depend on pressure and congestion, and are not diagnostic of pregnancy.

6. Occasionally at the fourth, and always after the sixth month, the child may be felt in the womb. After the third month there are rhythmical contractions, and alternate softening and hardening of the womb, which become more pronounced as pregnancy advances, and culminate in the contractions of labor. These were named after their first observer, Braxton-Hicks. They are diagnostic of pregnancy.

7. After the third month, and by the fifteenth week surely, when the placenta is attached to the womb and the cord is formed, ballottement may be elicited, which is the first and earliest certain sign of pregnancy. After the child has filled the cavity of the womb it will not be possible to obtain it. There is but one proper way to get it, and that is with the woman erect. The finger resting on the cervix is given a sharp upward lift while still kept on the os. The fœtus will in one or two seconds descend and convey to the finger a slight blow. The upward lift floats the fœtus to the fundus in the amnia, and as it slowly settles it conveys the second jar. The fœtus

A

B

Fig. 30.—*A*, Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Vertex; Position, Left Occiput Anterior. *B*, Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Vertex; Position, Right Occiput Anterior. (GRANDIN AND JARMAN)

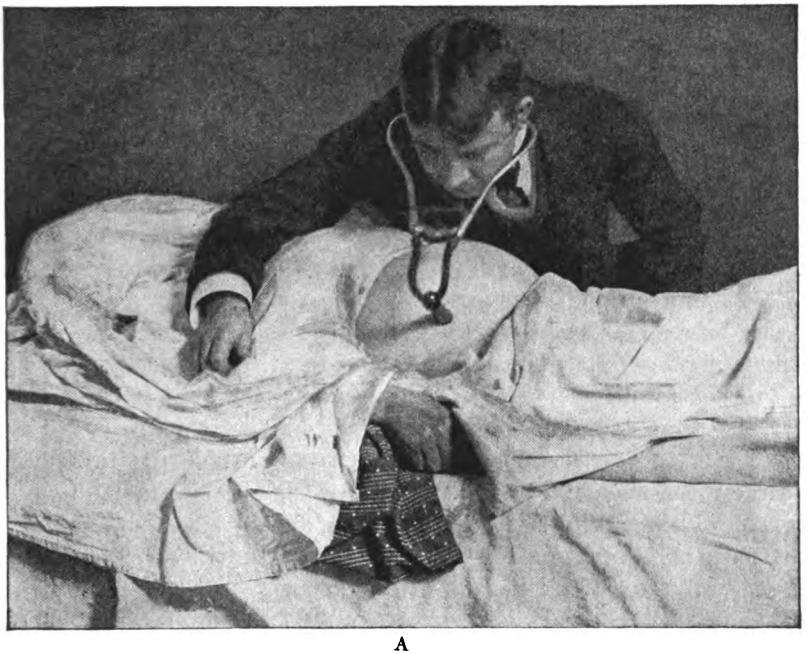
must be free and movable and in a relatively roomy womb, and there must be as well considerable delicacy of touch to get this sign, but there is nothing else that feels the same.

8. The softening of the cervix, which begins in the second or third week, is Goodell's sign. If the cervix is as hard as the nose, there is no pregnancy; but if it is as soft as the lip, there is.

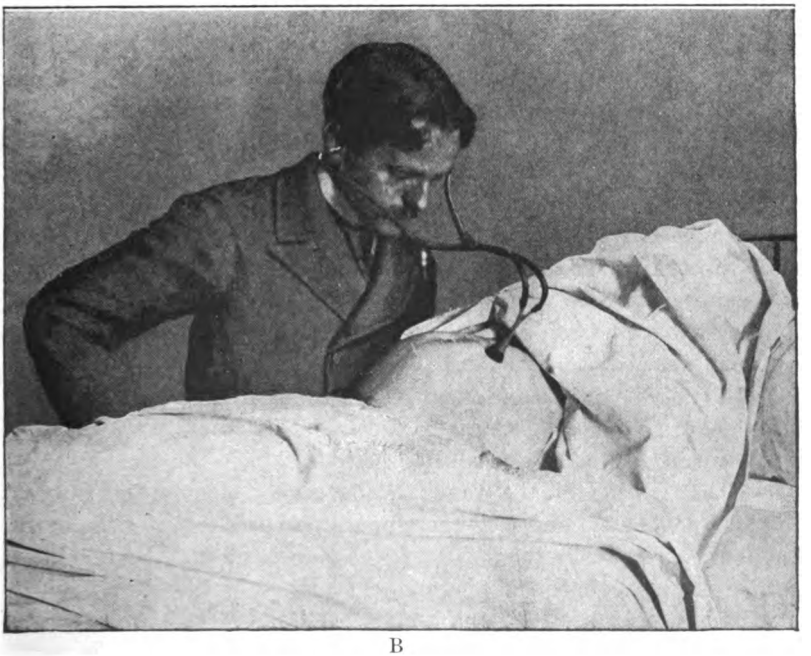
9. Closely allied to the above is Hegar's softening of the lower uterine segment. Bimanual examination will give the sense of no resistance above the cervix. It feels there as soft as if composed of nothing but membrane. With the finger in the rectum and thumb in the vagina they can be almost brought together above the cervix. It can be felt about the sixth to eighth week. At the fourth month the os opens and the examining finger can note that it is everted. It is claimed that a nodular irregularity of the womb can be felt earlier, the result of the lateral implantation of the ovum, and that it is a very early and reliable sign. I have never been able to feel certain enough of it to give it a diagnostic place.

10. An absolute proof of pregnancy is the sound of the fœtal heart. This was first noted by Meyer, of Geneva, in 1818, and is perhaps the most positive of all signs, but unfortunately cannot be heard earlier than four and a half months or the mid-point of pregnancy. It is double; the first sound is loud, the second shorter and harder to hear. Their frequency is 140 to 150 per minute and it has been likened to the ticking of a watch heard through a pillow. If the child kicks or exercises they will increase a little in frequency, and they change position with the child. The sound is transmitted through the back, that being the densest part of the child, and this is a valuable guide as to its position. In vertex presentations the sounds are below the navel; in breech, above. In L.O.A. they are best heard in the left lower quadrant. There is nothing like this sound, for it is independent of the mother. Of course, if the child is dead they will not be heard. During the period of Braxton-Hicks contraction they are louder and may not be heard during relaxation, and for the same reason they are best heard in primiparæ and those of tense abdominal walls. In the case of multiparæ with much amnia and very fat walls, some trouble may be incurred, but care will always find them. In a few cases congenital fœtal heart-murmurs have been diagnosed before birth, particularly pulmonary stenosis.

11. The placental bruit is a long-drawn-out, soft blow—"voo-o-o" of low tone, synchronous with the mother's pulse. There are two



A



B

Fig. 31.—*A*, Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Vertex; Position, Right Occiput Posterior. *B*, Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Breech; Position, Left Sacro-anterior. (GRANDIN AND JARMAN.)

theories as to its origin: first, that the blood rushing through the sini of the womb breaks up into fluid waves; and second, that it is caused by the pressure of the womb on the abdominal muscles. It may persist after birth or shift position slightly, and is heard whether the child be dead or alive. It is not a positive proof of pregnancy, nor can it be heard before the fourth month. During pains, it is strongest during the beginning of a pain and decreases in the interval.

A similar sign, lower and fainter in character, may at times be heard over the abdomen of the child and synchronous with the fœtal heart. This is the umbilical or funic snuffle or bruit, and is produced by the narrowing of the vessels at the navel.

12. Gray's sign, he claims, is diagnostic as early as the twentieth day. He says: "The normal triple phosphates of the urine are feathery and stellate. Very early the feather forms disintegrate and become crystals." To an inch of urine in a test-tube he adds one-third as much of Tyson's fluid, which will precipitate the phosphates in twenty minutes. Examination with a low-power lens will show the characteristic crystals in pregnancy. Tyson's fluid is composed of ammonia-chloride one part, aqua ammonia one part, magnesium sulphate one part, and water eight parts.

13. In February, 1904, Dr. H. E. L. Johnson announced a sign that was positive in one case as early as the fifteenth day. It depends on the Braxton-Hicks contractions and is a change of the vaginal color. At intervals of five or ten minutes, while watching the vaginal vault, it will go through a cycle of deepening and lightening. If not found on the first examination, it may be tried again and again. I have regularly exemplified this color change to my pupils on women close to term. Like all other color tests, it is best seen in brunettes. It has always proven correct as a very early sign in the cases where I have tested it and could be sure of it, but unfortunately the change has many times been too faint.

14. Rasch's sign is in bimanual examination transmitting a wave from above through the amnia to the finger below. It is a modified ballottement, available at the same period.

15. Palpation of the fœtus can never be done until the last third of pregnancy, and it is therefore almost valueless for diagnosis, but is, of course, absolute. The fœtal movement may be felt much earlier than the outlines can be felt, and is best brought out by placing the cold hand on the abdomen.

Of these signs the following are diagnostic and absolute proof of pregnancy:—

1. Ballottement.
2. Fœtal heart-sounds.
3. Palpation of the fœtus.

A majority of the following, known as probable signs, is equivalent to a diagnosis:—

1. Cessation of menstruation and regular womb enlargement.
2. Mammary changes.
3. Braxton-Hicks contraction.
4. Softening of the os and lower uterine segment.
5. Umbilical or funic murmur.

The following are presumptive signs:—

1. Cessation of menstruation.
2. Morning sickness.
3. Irritable bladder.
4. Mental and emotional changes.
5. Salivation.
6. Leucorrhœa and other signs mentioned.

These presumptive signs have no diagnostic value, being common to many other conditions, but do at once direct attention to the condition, and as they come early in time they are the first signs noticed.

In making the diagnosis month by month we have:—

First Month.—Menstruation has ceased, the cervix is softened, and there are an irritable bladder and congestion of the womb.

Second Month.—There are more marked softening of the cervix, pulsation of the vaginal vault, morning sickness, areola on the breasts, a flat abdomen as the uterus sinks, and well-marked congestion of the vagina, with bladder irritability.

Third Month.—The os has reached its maximum of softening, there is more morning sickness, umbilicus depressed, and at the end of the month the fundus is as high as the symphysis.

Fourth Month.—The navel is flat, womb in the hypogastrium, nausea ends, breast changes are marked, uterine murmur, and possibly at the end of the month, quickening. The fundus is about two fingers' breadth above the symphysis.

Fifth Month.—Quickening at the middle of the month, enlarged abdomen, secondary areola around the nipples, fundus half way to the umbilicus, and ballottement can be felt.

Sixth Month.—The os is patulous, striæ in the flanks, fundus at or just below the navel.

Seventh Month.—The cervix is elevated and posterior, fundus

two fingers above the navel, which now pouts, pigmentation of linea, the fœtal movement may be felt and the fœtus is possibly palpable.

Eighth Month.—Fundus half way between navel and ensiform cartilage, milk in the breasts, the fœtus is palpable.

Ninth Month.—The fundus is at the ensiform and the abdomen has reached its maximum distension.

Tenth Month.—During the last three weeks of this month the fundus settles to half way between the umbilicus and ensiform. During the last ten days there are pressure symptoms, the vertex engages, the cervical canal is obliterated, and some pain is usually felt in the last week.

In making a diagnosis it is well to remember that the womb may be enlarged by hæmatometra, physometra, pyometra, chronic metritis, subinvolution, myoma and fibroma, congestion, and hypertrophy. That the abdomen may be enlarged from fat, distended bladder, fæcal accumulations, ovarian tumors, ascites, pelvic hæmatocele or exudations, retroflexions and versions, tympanites, distended tubes, encysted peritonitis, ectopic gestation, and prolapse of organs. Also that pregnancy may exist together with ascites, ectopic gestation, appendicitis, bladder distension, ovarian tumor, pyosalpynx, ventral hernia or prolapse of organs, which will confuse and cause it to be overlooked.

It is only in hard tumors that errors of diagnosis occur. These may cause a discolored vagina, soft cervix, tender breasts, nausea, enlargement of the abdomen and irregular masses like the fœtal outlines, movements like the fœtus, and cessation of menstruation; but no case will show more than a few of these symptoms. A fibroid womb may enlarge, but there will be a history of hæmorrhage. Deposits of fat in elderly women and a rachitic belly may simulate it, but should lead to no confusion.

With all the signs at one's fingers ends mistakes will sometimes be made, although they are more often the result of careless examination. A suppression of menstruation in a woman the picture of health means that she is pregnant. Mistakes are so fatal to the physician's reputation that it is sometimes wise, like Brer Rabbit, to "lay low and don't say nothin'."

Unmarried women sometimes object to examination of their breasts, though submitting to vaginal touch. In such cases examine the heart, and by shifting the stethoscope it can easily be done without shocking any such delicate and impracticable modesty.

It must be remembered also that pregnancy may be concealed, feigned, or imagined.

Diagnosis of multiple pregnancy always remains a suspicion until the later months, when the fœtal hearts can be heard and the children palpated. The family history is important, twins being somewhat hereditary and primiparæ have twins with exceeding rarity. The diagnosis is based on

1. Extra large size of the womb and great pressure symptoms.
2. Unsymmetrical enlargement of the womb.
3. Imperfect or impossible ballottement.
4. Palpation of two heads and fœtal movements in different corresponding regions.
5. Two heart-sounds, with a space between and not synchronous.

The diagnosis of a previous pregnancy is often of medico-legal interest and is based on the breasts, abdominal striæ, the relaxed vagina, with loss of rugæ, the lacerated fourchette, the stellate cervix, and, upon post-mortem examination, possibly the corpus lutea of pregnancy.

CHAPTER V.

PREPARATION FOR LABOR.

BY THE MOTHER.

WHEN the woman first calls upon you to attend her, and the earlier she does so the better, it is a good time for you to give her some advice and counsel. This is especially needed in primiparæ and should embrace her clothing, bathing, exercise, and care of her breasts and alimentary tract. During the first months her appetite is poor and uncertain and she may not get nourishment enough, but in the later months it is apt to be great and she may get too much. The woman should have plenty of good, plain, wholesome food, but not too much nor too rich, lest the kidneys be overtaxed and the child grow too large. She should not indulge in tea, coffee, or liquors, not that the taste is inherited by the child, but that they are irritative to the kidneys. The use of milk should be encouraged. The bowels should be regular and move daily. The clothing must be loose, and corsets are to be laid aside, as their use weakens the abdominal wall. No garters should impede the circulation, and all clothing, as far as possible, should be hung from the shoulders. A daily bath should be taken, followed by a rub, as the skin excretion is very active and the kidneys are thereby saved. Exercise must be regularly taken in the later months, and walking in the open air is the best; but walking in the first half of pregnancy increases the congestion and results in nausea. This nausea is Nature's method of keeping the woman quiet and free from the danger of aborting until the placenta is attached. No jolting by carriage or railing is wise. The breasts as well as abdomen should be free from all constriction.

Free the mind from all care and worry, and especially take occasion to disabuse her of any old superstitions as to the possibility of marking her child. She should go to bed regularly and early, and sleep late. At this time she is peculiarly irritable and nervous, and her mind needs quiet and rest. Sexual intercourse should be seldom, never at the anniversary of her menstruation, and be absolutely interdicted in the last few months of pregnancy. Here is an important thing to remember and teach in your semi-official talks with men. I will speak later of the aseptic condition of the vagina and its ster-

ility before labor and of the need of keeping it so. Something is due from the husband in the way of self-control. How many men are there who ever think of washing before coitus? They are too apt to enter an aseptic vagina just before labor and carefully wipe off all the germs incubated behind a redundant foreskin as high as possible. If there is any washing done, it is afterward. Normal intercourse at proper times harms no woman, no matter how often. If it is injurious to her, it is usually some fault in the act; but during pregnancy it is to be discouraged.

Any leucorrhœa, which is common, should be treated by mild astringents and cured before labor.

No matter how great the nausea, the woman should not get into the habit of going without breakfast. The "longings" of pregnancy are for food-products not usually needed, and in limits of reason they may be respected. Find out if it is a real instinct for some articles of food, and, if so, let her have it. Sea-voyages and vomiting are very deleterious, also lifting up of the arms, as in dusting high objects; these seem especially to bring on abortion.

The whole subject is summed up in getting the woman back to a perfect physical condition, where she seldom is; and living as she should, but never does.

There are two things especially needed to fit the woman for labor: (1) Good, rich blood. (2) Muscular strength, especially of the abdominal muscles. The first prevents anæmia from subsequent loss of blood, itself is a germicide, and with it she can combat sepsis. The second not only conserves life and vigor of the body, but renders labor easy, lessens the danger of postpartum hæmorrhage, and favors uterine involution.

The pugilist undergoes arduous training before his hour of labor. The athlete must be in perfect physical health, and so, too, the pregnant woman should be in the "pink of condition." All this takes time, and the earlier you get at it the better, and your fee should be large enough to cover this long period of her life.

The pregnant woman is not sick, for she is undergoing a physiological process that may be likened to the fruitage of a plant. Women are sensitive to exposure in this condition, and rarely go out enough and delay calling in a physician. And right here I want to give a little plain talk. Confinement is to every woman a shock. It is an unnatural association with a stranger of the opposite sex. The female is modest by nature, because for ages she has had to protect herself from the advances of the male. The Venus de Milo is not only a

perfect female form, but it owes its charm to the attitude of instinctive modesty it portrays. We feel that we are in the presence of a truth in morals, and do reverence to that virtue. The evolution of modesty in the female springs from her desire to please and the reverse, or dread of giving offense. Approach the subject without reserve, as a gentleman should, and she will willingly submit to whatever is proper and necessary. A woman yields her virtue only when she knows herself desired, and is then freer than the male, or, as Chaucer puts it: "He sayde, a woman cast her shame away, when she cast her smock." The prostitute is perverted only, for from her experience she is shameless because she thinks all men, at least all she has met, desire her. She considers any man who is disgusted at her, wrong somehow; the scorn of her virtuous sisters she lays to jealousy at her superior attraction or to lack of sexual feeling. What we condemn in her is a conclusion based on partial knowledge, for which she is to be pitied. Far too frequently all the men she has ever met were keen to attack her virtue, and in her vanity she follows her sex birthright to please.

In dealing with women be bold; examine her as a matter of business, and never allow any disgust to show in the face or manner. I have known women even in their pain as the head was born apologize for the passing of fæces impossible to control, in an agony of shame that overpowered her physical suffering. Tell her that you are glad to have it out of the way, that it generally happens, and soothe her distress if you can. It is such little things that endear you to their hearts and make "their doctor" closer even to them in some ways than their husbands. Her confidences must be sacred and her trust never betrayed.

And one other thing. I hate the rough, hurried, Tom Sawyerism that medical students are apt to assume. You learn the art in the presence of charity patients and they have to stand it, but the sooner you get out of a manner that is ruinous in after-life, the better. Cultivate a soft, smooth, kind, courteous, and considerate treatment of every case. Interneships harm about as much as they help, for this very reason.

In examination, first use your eyes, then your ears, and lastly your hands. To handle the patient first is a sign of weakness. There is a class of misguided but otherwise intelligent people who believe a fracture can be cured by prayer. You are beyond this, but it sometimes seems as if the student still believes in the efficacy of the laying on of hands. I beg you to remember that medicine and the-

ology have long since been separated. If you are kind to hospital patients, they will meet you half way and even court examination and study of their complaint.

THE BABY CLOTHES.

These should be all ready by the seventh month, and it is well to inspect them yourself and know that all necessary things are ready. The modern tendency to plainness is a good one, especially for the clothes that will be worn for the first few months, which should be washable. A change of these should be folded and placed on top of the basket and the whole set in some accessible place, known to others of the family or nurse besides the woman, so that she need not be disturbed in getting them out. She will need:—

Basket.—This should be very simple and should contain a soft hair-brush; a piece of white Castile soap; powdered orris-root, starch, or talc powder, not perfumed, in a bag or a box and puff; three sizes of safety pins; common pins; a soft sponge or cotton pads; four ounces of a 4-per-cent. boracic acid solution; eight ounces of sweet oil for the first washings; plenty of soft, clean cloths; scissors, and an eye-dropper.

The Clothing for the baby will be, first:—

Sterile Gauze.—To dress the navel. This the physician usually carries with him.

Belly Bands.—There should be several of these, to change if soiled. They are best made of opera flannel, five inches wide and sixteen inches long, and can be torn to fit. They should not be hemmed above all things, but may be herring-boned over the edge, or pinked. A plain piece of flannel is the best.

Diapers.—These should be thirty inches square, folded to fifteen diagonally, and are best made of Canton flannel. A mother can hardly have too many of them. Two dozen are absolutely needed.

Shirts.—They are made of soft flannel, with large arm-holes, and should be six or seven inches long, reaching to the hips. Between arm-holes and the back four and a half inches will fit the average baby, and the arm-holes should be six inches in circumference. The sleeves should be practically straight, so that when a cuff is turned back it will not bell at the wrist.

Pinning Blankets.—Should be about twelve inches across the top and at least two feet long, three is even better, so that the bottom may be turned up to keep the feet warm. These should be made of flannel, except the yoke.

Slips.—Are best made of flannellette; should have a neck of five inches, and be eight inches across the shoulders and be at least two feet long. A shawl or square of flannel is a good thing to place over the head, and in cold weather woolen socks should be placed on the baby's feet.

Binders.—These are for the woman's use, but are to be laid away in the basket. She will need about four. There are several styles: many-tailed, gored to the hips, or plain strips of cloth. The best are plain strips of cotton flannel, one and a quarter yards long by a yard wide, folded to eighteen inches, the fold to go downward. The placing of the binder you should do yourself. I have seldom found a nurse who could do it properly. The fold should go two inches below the point of the hips and not be above the pelvis behind. It should be pinned very tight below and if this is done it will not slip up. The binder should be looser the higher you go, and should have at least six pins. The sides should then be gathered with a pin on either side so as to fit the waist line. The binder has no effect in preserving the shape and is a detriment in preventing the involution of the womb, which largely depends upon movement for its stimulus. It is such a comfort to the woman for the first few days, however, that it is usually put on.

At least two weeks before labor, the woman should provide five yards of cheese-cloth, a new fountain syringe, hot-water bag, one pound of absorbent cotton, one dozen clean towels, four ounces of boracic acid solution, four ounces of whiskey, five yards of 1-2000 bichloride gauze, two ounces of lysol, safety pins, two ounces tincture of green soap, one square yard of oilcloth. She should also make two obstetrical pads of cheese-cloth and raw cotton, twenty by twenty-four inches square. Many of these articles of wearing apparel can now be bought cheaper and better than they can be made.

THE NURSE.

And now a word as to nurses. They greatly lighten the physician's load—that is, good ones. Asepsis must be had, and the trained nurse alone is safe to leave with the patient. In the country one will have to get along with some woman of vast personal experience who is willing to do all the housework and nurse the woman and child besides. These women must be watched in every case. Whenever possible, I believe the hospital is the best place and safest for the confinement, but there are arguments on both sides. If a trained nurse is engaged in the home the extra work, expense, and washing will

more than amount to the hospital expense. In the cities, especially among the foreign-born, the *sage femmes* or midwives still handle more than half the cases and also furnish the hospitals nearly all their sudden obstetrical emergencies. The dangers of such help are infinite. She may have a face like a benediction and still be trying to cure ophthalmia with breast-milk; she may allow an asphyxiated baby to gasp its life away, leave in a portion of placenta, or spin yarns while the loosened ligature is allowing the baby to bleed to death. While the woman is yawning, hearing bells, and flooding, they "fear no evil." The breasts may cake and be treated with parsley tops, or sepsis may come and the husband be told all women have milk fever. And I can tell you such cases by fifties. You laugh at this ignorance, but, believe me, those of us who have been in practice and seen the cruelty, the wrong, the injustice, and the needlessness of it all, weep tears of rage, pity, and helplessness. We have met too often the blind, the asphyxiated, and the hopeless cases, and too often seen the tears and sorrow that have resulted, to laugh. Perhaps it has come close home to us. The sorrow of a mother over her long-hoped-for baby—dead. The dry sob of the husband whose wife lies dead of sepsis, mingled with the wail of her starving baby—believe me, there is no sadder sound. As a surgeon I care not at all for tears and screams or pain; it never disturbs me when at work for the patient's good. But my heart is very tender toward the woman in her hour of pain and trial, and many times the tears are very close to the surface in sympathy or pity. And God knows how much of it is uncalled for! Choose well your nurse.

The nurse should be engaged early, and you should meet her before hand and judge her capabilities, if a stranger.

ASEPTIC RULES.

While labor is physiological when the woman is normal, but few are in that condition. The art of midwifery requires manipulations, and every manipulation has its elements of danger, and the one common to all is sepsis. The vagina is before labor both sterile and antiseptic. At the end of the first stage and before any danger of laceration, Nature has provided a saline douche from above in the amnia, the child wipes the passage, and lastly, after the birth and hæmorrhage, the placenta sponges the parts and any damage is done afterward. Any germs present come from without and are foreign to labor. Your hands are misplaced in the vagina unless the gain is greater than the loss. Digital examinations are not needed in

every labor, and must be aseptic and as few as possible. The womb with its lacerated tissues, blood-serum, warmth, and moisture, is an ideal culture-bed. The woman is weakened and exhausted and unable to offer normal resistance, the lymphatics are active, the relieved tension renders the blood-current sluggish, and the veins lie open, only closed by soft coagula.

In no other operation does the field lie so close to a septic region like the anus or is exposed to the air so long. Other surgery in like conditions would rival in mortality preaseptic days, and yet the wonderful act would be free from danger if the hands could be kept clean.

Because of the anal proximity, deliver on the back, and in wiping the vulva you must wipe down. The so-called "five-sponge-wipe" is very good as a routine measure. For every examination you are to as carefully prepare as if going into the abdomen. The hands should be scrubbed for five minutes in hot soap and water, nails cut short and cleaned, using stick, brush, and towel. The hands are then to be sterilized in lysol, permanganate and oxalic, chlorinated lime and soda bicarbonate or alcohol. Bichloride is a cheap but poor antiseptic. Common spirits of turpentine is very good and the lime method perhaps the best, especially if any pus has contaminated your hands recently. Rubber gloves that have been boiled are to be used and the clothing covered by a gown. If the hair has dandruff it should be covered. No man with boils, ozena, or catarrh of the nose should do this work, nor attend a case for two weeks if he has seen a case of scarlatina or erysipelas or had his hands in septic pus.

Prior to labor the woman is to have a bath by pouring water over her, not prone in a tub lest the scales be washed into the vulva. The vulva is to be syringed off, the hair clipped, not shaved, scrubbed with green soap, and a pad put on. All bedding must be clean and newly washed, towels used are boiled and wrung out of hot bichloride. Basins and bowls are scalded out. You can usually estimate the cleanliness of your surroundings by the layer of dirt on the sides of the wash-basins in general use, and your advent should be a beginning of boiling and scalding such as they never saw before. It is a good rule before labor to especially caution the woman to allow no one to make an examination before you get there. In country practice especially, the cases are usually nursed by some old woman of positive ideas and a courage of her convictions that the physician of more experience may envy but has long since lost. She will always want to examine the woman to tell whether or not to send for the doctor,

and I make it a bad half hour for some one if I learn that this has been done.

When making an examination hold open the vulva with the left hand and by sight insert the finger directly into the vagina. No douche is to be given before or after labor, and for this reason it is well to learn if they have a "family" syringe. If so, get hold of it and either carry it off or accidentally tear it. It seems a temptation few nurses can resist, and the general utility tip is not a safe thing. In the future, fewer and fewer examinations will be needed. Often I do not examine per vagina at all. Once when you first arrive, to determine labor and its advance, and once again as the waters break for engagement, will be all any normal case requires, and even this is not always needed.

Before Lister the mortality of childbirth was from 2 per cent. to 10 per cent. Modern hospitals run $^1/_4$ of 1 per cent. from all causes. At the Sloan Maternity it is about one in three thousand.

PELVIMETRY.

About the seventh month also the woman should be externally measured and, if not done before, a vaginal examination made. It is well to have the day and hour appointed and to keep it promptly. The woman is then prepared for you and at home. By this time every primipara is to be measured, and every multipara whose history you personally have not taken before. At this time you are to notice, first, the position, presentation, viability, existence of pregnancy, approximate length of gestation, twins, position of placenta, and the child's condition in general. Second, the mother-breasts (shape and size), nipples, secretion, etc., old lacerations, hæmorrhoids, measurements, contour of abdomen, tumors of bone or soft parts, and heart-sounds and œdema. Third, by vaginal examination the size and shape of pelvis, position and presenting part, placenta (if prævia), lacerations of cervix, opening, eversion, etc.

Pelvimetry is one of the few points wherein we now excel our forebears. It is of the utmost importance and will reasonably guard you against any deformity. The measurements usually taken, and quite sufficient for all practical purposes, are three, while the woman is on her back: between the anterior-superior spines, between the iliac crests, and between the trochanters. Three are taken on her sides: the external conjugate between the sacro-spinal articulation and the front of the symphysis, and between the two posterior-superior spines and the opposite anterior-superior spines. The woman

must be turned from side to side. Lastly, there are three while on her back: internally from the crest of the sacrum to the lower edge of the symphysis, the transverse between the tuber-ischii and the anterior-posterior at the outlet, from coccyx to under edge of symphysis. In using the pelvimeter the balls should be at the tips of the middle fingers, feeling, as it were, with the pelvimeter.

With a woman on her back, the finger tips are placed on the pelvimeter and the distance between the anterior spines noted. This is the interspinous and should be 25.5 centimeters (10 inches).

The points are then slipped back to get the widest flare of the crests of the iliac. This is the intercristas and should be 28 centimeters (11 inches).

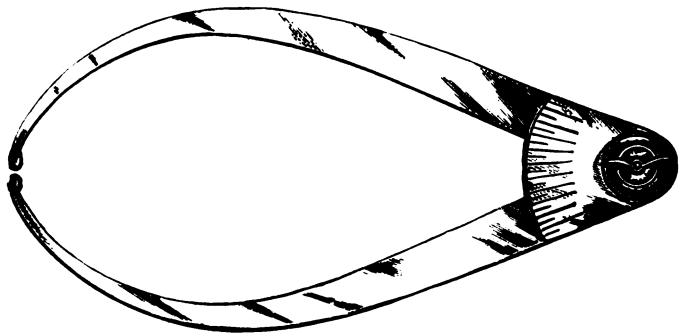


Fig. 32.—The Pelvimeter. (GRANDIN AND JARMAN.)

The bitrochanteric is next taken in the same way and should be 31 centimeters (12.5 inches). These should be "10-11-12" and in the order named.

Now turn the woman on one side and place one point in the depression-point below the spine of the last lumbar vertebra and the other in front of the symphysis. This point is marked, when the woman is erect, by a lozenge, and the center of this is the point taken. Variations in this diamond-shaped space are proof of deformity. This external conjugate should measure 20.25 centimeters (8 inches). Between the posterior-superior and opposite anterior-superior spine (and to get both the woman must turn over) is 22 centimeters (8.75 inches). These oblique measurements take their name from the posterior, as before noted, the right oblique being from the right posterior spine and the left anterior. These, if the same, denote an equally bilateral pelvis, and therefore free from one great class of deformity. The woman should now be placed on her

back and prepared for vaginal examination. When possible, the hand is the best instrument to use; but for exact work, to determine slight variations, the pelvimeter of Faraboef is needed. This instrument is very accurate and the only exact way of getting the obstetrical conjugate vera.

First the promontory of the sacrum is felt for with the tip of the

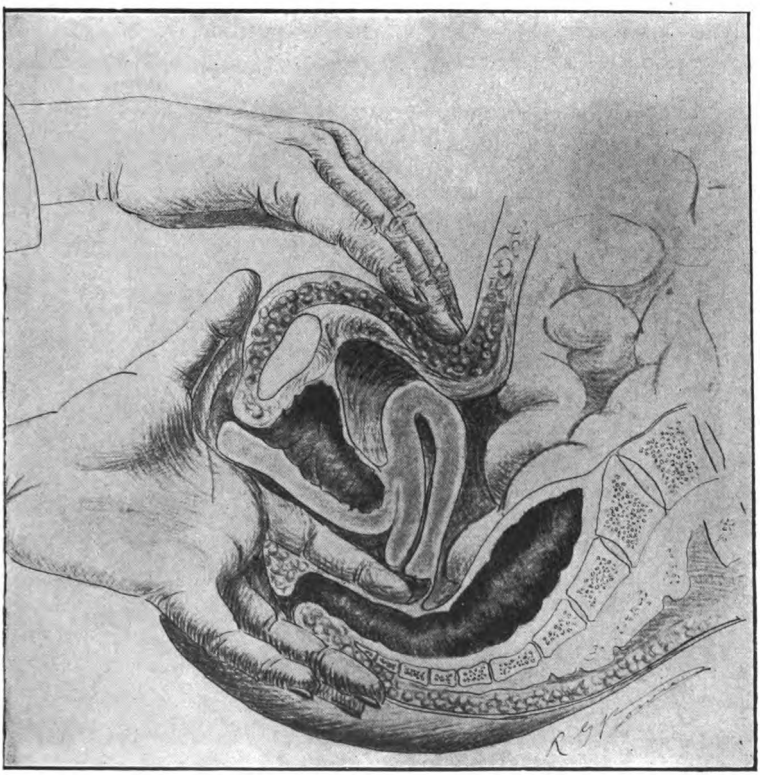


Fig. 33.—Bimanual Examination. (GILLIAM.)

middle finger, and the distance from this to the under side of the symphysis taken off by the finger of the other hand. An assistant should take this measurement with the pelvimeter. This is the diagonal conjugate and should be 13.5 centimeters (5.25 inches). The diagonal is but the basis for figuring the true internal or obstetrical conjugate. In general we subtract 2.5 centimeters (1 inch). It is best to be on the safe side and not overestimate this, the most important obstetrical measurement, and the one most often found

deformed. The most projecting point of the sacrum is to be taken, whether it be a secondary promontory or not. The distance between the ischii can be very clearly estimated by widening the first and second fingers. The outlet, coccyx to symphysis, can be measured direct with the instrument and is 12.5 centimeters (5 inches). It may be taken on the hand also as the diagonal conjugate.

When making the pelvic examination, the finger should be swept around the whole brim as far as possible, to determine its shape, the presence of exostosis, or any abnormality. The spines may

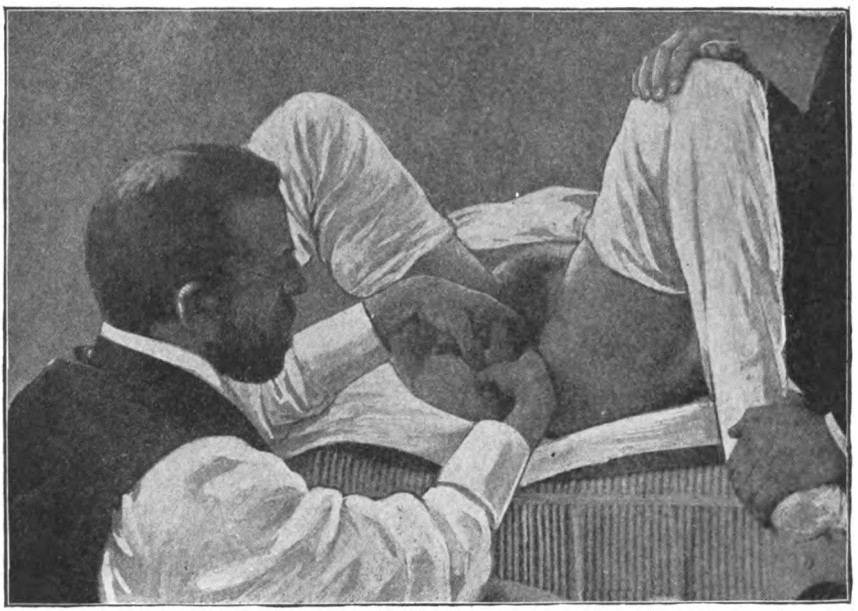


Fig. 34.—Determination of the Diagonal Conjugate by the Hands.
(GRANDIN AND JARMAN.)

narrow an otherwise roomy pelvis by unusual projection. The direction and thickness of the symphysis and arch and curve of the sacrum must not be overlooked. The tips of the thumbs under the arch with palms extended over the buttocks will show the curve of that part.

Any marked lessening of the interspinous or intercristus is suspicious. If they are equal, it is probably a rachitic type of pelvis; but with all of these the relative size of head and pelvis must be considered, and is an unknown factor.

The true conjugate has always been hard to measure accurately. Some men cannot reach the promontory at all. The instrument of Faraboef lengthens the finger and has a piece that, going up into the urethra, gets the plane of the symphysis accurately. S. Kutoch has a pelvimeter, one arm of steel and one of lead. The steel knob is placed on the promontory and the lead bent to a point on the exterior surface. This measurement is taken and then the distance from this point to the internal of the symphysis read and subtracted.

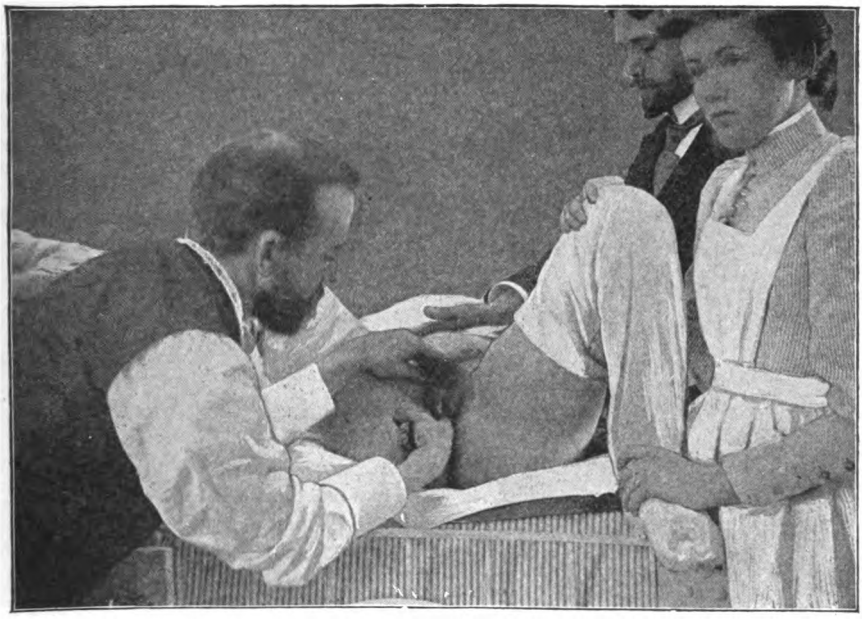


Fig. 35.—Depression of the Uterus so as to Determine Adapability of Presenting Part to the Pelvic Brim. (GRANDIN AND JARMAN.)

With a woman under chloroform and a roomy vagina, it is sometimes possible to measure with the hand, useful especially just before version in a doubtful case. Great care is needed not to rupture the vagina. The width of the hand across knuckles is about 8 centimeters (3.25 inches). In applying forceps, if this is not present some other measure will be indicated. The width of the hand with the fingers closed over the thumb is 9 centimeters (3.5 inches), the closed fist, thumb extended, is diagonally 11.5 centimeters (4.5

inches), the closed first is 4 inches, and the four finger tips are 6.3 centimeters (2.5 inches). This is but a hint for you to follow up.

The x-ray has been experimented with, but has proven to be of little help in determining the position of child or deformity.

In 1900, Kurz announced that the sternum and true conjugate measured within 1 centimeter of each other, no matter what the deformity. I have found this absolutely false in several series taken.

The inclination of the pelvis planes can be obtained by a level.

Measurements of the child's head are not accurate, but may give valuable information. Perret takes the occipito-frontal as near as possible and subtracts one inch for flexion. He then pushes up the

Fig. 36.—Abdominal Palpation of the Pelvic Pole of the Fœtus, the Vertex Presenting. (GRANDIN AND JARMAN.)

abdomen and subtracts its thickness. The results vary too much for great accuracy. Dr. Stone, of New York, following Perret by subtracting 2 to 2.5 centimeters, according to size of head, has reported accurate results. How much moulding takes place is, of course, unknown, but it is about $^1/_2$ centimeter.

Müller forces the head into the inlet, and if it will engage expects no difficulty to labor. This merely means that the head will not catch at the superior straight, which is by no means the only constriction. The hand in the vagina grasping the head will, with sufficient experience, give an idea, but it is of necessity inexact. Monro Kerr performs this by passing two fingers into the vagina while the thumb is over the symphysis. The other hand presses the head down

and into the pelvis. It is of interest here to estimate the effect of prematurity on the head. Aside from its softness, which is of more importance than size, the biparietal at seven months is about 7 centimeters (2.8 inches), at eight months 8 centimeters (3.2 inches), at eight and one half months 8.5 centimeters (3.75 inches), and at term 10 centimeters (4 inches). Measurements have shown that the occipito-frontal increases about 3 centimeters (1.2 inches) in the last two months, 0.75 centimeters (0.33 inch), the last three weeks, 1 centimeter (0.4 inch) the last two weeks, and 0.5 centimeter (0.2 inch) in the last ten to twelve days. This is a guide as to how late labor might be induced in deformity.

Fig. 37.—Abdominal Palpation of the Dorsum of the Fœtus.
(GRANDIN AND JARMAN.)

Having measured the pelvis, it is equally important to palpate the abdomen and determine the size, shape, position, presentation, twins, and amount of liquor amnii present. The woman is on her back, bladder and gut empty, and hands warm. Note by inspection the size and shape of abdomen, the axis of the womb and the thickness of the walls, and the striæ and pigmentation. With the flat hand feel for the back first. This is smooth and hard, not nodular.

The first step is to use the fundal grip with both hands and facing the woman. From this you get the presentation of the child, whether cephalic, caudal, or transverse. When this last has been settled, in the same position proceed to the second or umbilical grip. From this you can determine the position on its axis of the child,

whether it is dorsal or ventral. The third or pelvic grip is divided into two parts. In the first we use one hand only and grasp the head in the pelvis. From it we learn the flexion and the presentation present. In the second manœuvre we change to face the woman's feet and with both hands go deep down into the pelvis on either side of the head or breech, and can determine from it all that we can learn from the others. It is therefore the most valuable and serves to confirm and check all the other grips. When the back is determined, feel the knees and elbows. The extremities feel like cylinders that move and slip. These feel like knobs and will sometimes kick while you are finding them. The head is hard and globular, like a base-ball, and

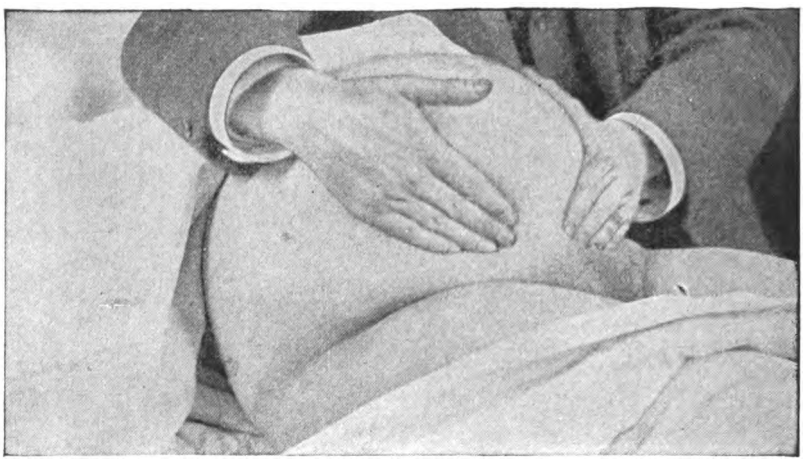


Fig. 38.—Abdominal Palpation of the Pelvic Brim. (GRANDIN AND JARMAN.)

joined to the back by a marked groove. The back is smooth and convex, while the belly is concave and lumpy. The breech is round like the head, but softer, and is continuous with the back.

The flexion can be told by pushing down above the pubes and getting head between the thumb and fingers, when its shape and contour can be made out. By rolling it in the hand it is possible in many cases to feel the face and chin. Palpation must be by the whole hand, as finger-tips, "playing the piano," will invariably bring on a spasm and result in failure.

Next by auscultation locate the placenta, which is on the ventral side of the baby and should normally be in the upper half. The fœtal heart should be heard best through the child's back in the

opposite lower quadrant to the placenta, beating 130 to 140 per minute. If the child is pressed over it will sound louder, and also is best heard when a contraction is present. If the heart is on the left, it is a left position. The intensity of the sound gives an idea also of the water present, as solids conduct sound better, it being faint when the fluid is abundant. The sex can be told in a little over half the cases, being more rapid in females. Under 130 it is probably male.

It will help to determine the fœtal position to find out where the woman has felt the most motion. If in the right upper quadrant under the liver, it is almost certainly a L.O.A., the most motion being made by the feet.

Any claim to feel the placenta seems to me a refinement of intellect more than of touch. If the bulk of the womb is anterior to the tubes, the placenta is probably anterior. The child is longitudinal in $99^1/_2$ per cent. of cases. It is vertex in $95^1/_2$ per cent., face or brow in $^1/_2$ per cent., breech in 3 per cent., and transverse in $^1/_2$ per cent. The head is down because: first, the navel is placed below the center of gravity, and by the time the child can move it is more or less fixed; second, it involuntarily prefers this in order to move its legs and exercise by kicking. The brow is the long arm of the liver and the head is usually flexed, the occiput presenting. Statistics show that 70 per cent. of vertex are L.O.A. and about 30 per cent. R.O.P., while R.O.A. and L.O.P. are very rare. That is, the long axis of the head is rarely on the mother's right anterior plane diameter. The reasons given for this are:—

1. The rectum, so often full, fills the right side, especially behind.

2. The muscles of the right side are more developed and thicker.

3. For the same reason the spinal column often bends a little to the right.

4. The womb inclines to the right, the mesentery is attached firmly, and the intestines can only move on the left side, forcing it over.

THE PHYSICIAN'S KIT.

The physician should send to the house beforehand if possible, and if not, take with him, the following, which will provide for nearly all emergencies, especially in the country:—

One yard of plain gauze, cotton, cord ligatures, hypodermic syringe, hypodermic tablets of strychnine, morphia, ergot, and

atropia; chloroform, carbolic acid, argyrol solution or 2 per cent. $AgNo_3$, powdered boracic acid, lysol, green soap, tape, catheter, hæmostats, carbolic vaseline, antiseptic tablets, nail-brush, oilcloth, baby scales, dropper, gloves, forceps, dressing forceps, gown, scissors, scalpel, trays, needles, ligatures and needle-holder, acetic acid, transfusion needle, and ergot. Few of these will be needed ordinarily, but all must be available. It is your duty to know beforehand:—

1. That she is pregnant and the time of delivery.
2. Her physical condition.
   (*a*) General health.
   (*b*) Absence of eclampsia.
   (*c*) Absence of placenta prævia.
   (*d*) Size of pelvis.
   (*e*) Condition of breasts.
3. Her habits, her social standing, circumstances in life, intelligence, previous history, and religion.
4. The child—whether alive, position, size, and presentation.
5. Her preparation as to nurse, clothing, and instruction as to care of her baby and breasts.

To neglect any of these points is to fall short of doing your best for the woman. You are to allow no danger to slip up on you unsuspected, or even be responsible for a death from lack of attention on your part. Unless you know these, what might you not be confronted with when labor begins? Then there is no time for consultations or reading up. It is too late.

When sent for, go at once. These cases are to take precedence of all others. Upon arrival at the house, go at once to her. Examine pulse, tongue, and pains. Note their frequency, character, and how she is bearing them. See if room and bed are prepared. If it has not been done, and there is time, have enema given and a bath, vulva scrubbed and clipped. While this is being done, sterilize yourself, set out all bottles and solutions required, put instruments on to boil, and have everything orderly and at hand. The hands are sterilized last of all, gloves must be put on, and then when the woman is prepared she is examined. This must last over a pain, to determine its character and results. The finger is inserted without touching the vulva and the following are noted:—

1. State of perineum—relaxed, rigid, or tense.
2. Capacity and room of pelvis.
3. Moisture, secretion—hot or cool.

4. Cervix—its dilatation, ragged, thin, swollen, hot, everted, distensibility. All this during pain.

5. The presenting part, position, flexion, engagement, movement, membranes, etc.

When this is done, speak encouragingly to the woman, assuring her of progress and her normal condition, and leave the room. Don't hazard a guess as to when it will be over, but warn her not to be frightened when the waters break. A pad is put on and she is left alone. When the os is the size of a dollar she should go to bed and use a bed-pan afterwards. Examinations should be infrequent and are less needed as our knowledge of external palpation develops. The first stage is one of physiological restlessness, and it is well for the woman to stay up and walk. Put off giving chloroform as long as the woman don't ask for it; once begun, it must be kept up.

When the waters break an examination is not objectionable, but is again not needed. Any changes in position or flexion must be done then, before engagement. When the head is distending begin chloroform, and push it to anæsthesia as the head is born. If you can deliver the head between pains, look out for the shoulder, turn child to right side, wipe out mouth, etc.

From the time the woman begins to bear down, usually a little before the rupture of the membranes, until one hour postpartum, the doctor should not leave the house. It is a good plan to see her cleaned up personally and put on the binder and pad yourself. When the child is oiled and dressed, take it yourself and put it to the breast. Nursing at once is instinctive; later, it may have to be taught. It is especially valuable to the mother in contracting the womb.

You should return within ten hours and note the mother's temperature, pulse and look, the amount of food taken, passage of urine and fæces, whether she has slept, the condition of her nipples, whether the flow be free or scanty. You are to note the baby's temperature and appearance and the condition of the cord, inquire into its nursing, bowels and fæces and urine, and particularly note the condition of its eyes. The woman must not be allowed to go longer than twelve hours without urinating before you draw it with catheter or probe.

The night of the second day she should have a dose of castor-oil or other sure means of emptying the bowel. This will prevent any confusion between a septic and constipation fever. The bowels are apt to be sluggish from the relief of the abdominal pressure, and seldom move naturally. After the first twelve hours the more the woman

rolls around the better, as it aids involution. For the first three or four days you should call twice a day, and on alternate days afterwards. If there is a laceration, either repair it at birth or tell the woman of it and give reasons why it is better to attend to it later. The labor is hard and they realize it then and will forgive a tear; but if it is found out later, or especially is diagnosed by another physician, perhaps not friendly to you, it is certain to leave the woman dissatisfied with the way her case was handled. The physician must use every effort to protect himself and leave the case with such a cordial feeling on the family's part that they turn to him again without consideration of any one else; to say nothing of the advertisement she will be for you to her friends. She will not remain neutral, but will fight either for or against you.

It should be a standing rule to forbid all visitors during the first week, and this must be distinctly told the nurse. Where I have neglected this I have several times found a noisy, half-drunken crowd drinking success to the baby and incidentally disaster to the mother. In country practice all the ladies of the neighborhood run in to offer help. This latter often comes from real kindness and the necessity in the country for mutual help in time of sickness.

Unless you know your nurse, positively forbid any food to the baby but the milk it gets from the breast, or water. Sugar-teats, pap, chamomile or saffron tea, peppermint, paregoric, anise, etc., are not needed and are positively pernicious. After you leave the case you can't help yourself, and it will probably be done by the mother and the baby will be dosed with corncob and molasses for worms, and sulphur for its blood, until age enables it to rebel. These things are the usual cause of colic. All the baby needs is to be kept warm and regularly put to the breast.

Meddlesome midwifery is the curse of the art, for it is such a temptation to do something. Replace this by the endeavor to get back to Nature, then "consider her ways and be wise." Try to see how little you can do at a case. Hands off and a masterly inactivity should be the rule. The new graduate of to-day knows "too damned much that ain't so," and sees pathology in every natural act. Obstetrical operations, after all, in nearly every case, only shorten time and correct what the woman would do herself if she had strength enough. As long as she is strong, let her alone. Over 90 per cent. of the labors would end all right if there were present some one merely to cut and tie the cord and take away the baby for a few minutes.

THE NURSE'S DUTIES.

As mentioned before, she should be trained in all aseptic details, be strong, young and tactful, and known to the patient and physician. I have yet to see the ideal nurse, with knowledge tempered with modesty, nor do I expect to until our human natures are perfected beyond. There is one thing she must have, and that is an absolute willingness to obey orders. I much prefer a female friend to one in whose obedience I have no confidence. She should know beforehand the position of the bedroom, bedding, towels, baby-clothes, etc.

The nurse is to take with her, or know that the patient has, a douche-pan, two rubber blankets or substitutes, cotton, binders, hot-water bottle, hand-scrubs and green soap, bichloride tablets, fountain syringe, a gown, and a breast-pump. At the first symptoms of labor she is to give the woman a pour-bath and rub, clip the hair from the vulva, give a rectal enema, scrub the vulva, and put on a pad and a clean night-dress. Then she is to make up the bed for the woman, using clean sheets. The bed should be in a large and well-ventilated, sunny room. The best room in the house ought to be chosen. The right side of the bed should be prepared, and if the springs are too soft a leaf from a table can be used to stiffen them, for a hard bed is needed. Over the mattress another sheet or newspaper-pads are placed, and over this a sheet is spread and pinned down to the mattress. On top of this a second rubber sheet is spread, and then a draw sheet. The draw sheet is protected by one of the obstetrical pads and a Kelly-pad if one is available. A clean sheet should be used to cover the woman, and blankets are preferable to quilts. Spreads, like quilts, are best taken off the bed, as they soil easily and are not readily washed.

The nurse is to see that there is plenty of boiled water, both hot and cold, available for instant use, and that all solutions for the hands are made. The instruments she is to place in the trays and have boiled in soda and water. All the baby clothes are to be taken out and dried before the fire.

When the examination is made she is to get the woman into position for it, so that the finger may enter the vagina by sight. When the bearing-down pains come, she is to get a sheet rigged up to pull on, and be present in the room. Especially must she not allow the woman to go to the toilet alone. As the head descends she will envelop the limbs in obstetrical drawers if they are used, or towels, which I consider better, and keep the vulva wiped down as fæces pass.

When the head is born she should be ready with a warm blanket to take the baby, holding it on its right side with a warm, but not hot, water-bottle at its back, and carry it to a warm, safe place, after wiping out its mouth. She must be prepared to furnish a very hot douche, medicated as may be desired, on an instant's notice should a hæmorrhage occur, massage the womb, or assist as may be needed. She must also see that a receptacle, its edge covered by a sterile towel, is ready for the placenta, and must save it until examined by the physician.

All stages being over, she is to withdraw soiled sheets and clean up the woman under the doctor's direction, putting on pad, binder, etc.

The baby then demands her attention. The first dressing should be preceded by a plentiful oiling of the skin and removal of the vernix without using any water. The physician will usually dress the cord himself. The baby being dressed, the last act of the toilet is to wipe out its mouth and attend to its eyes. The mother's breasts and the baby's mouth must be wiped out before and after each nursing. Twice daily a pouring over the vulva of a hot saline solution is very cleansing and grateful to the mother. The nurse must be able to show the mother how to nurse the baby, see that it is done regularly on alternate sides, every two hours, and not allow it to go to sleep nursing. For the first three days the woman can have fluid diet, which the nurse must prepare, and a large menu is quite an accomplishment; but she must not sit up until the fundus is at or below the pelvic brim.

The baby must be changed promptly when soiled; and if it has not passed water and fæces, the fact must be brought to the doctor's attention, as well as any abnormality, caked breasts, cracked nipple, odor to flow, soreness, sleeplessness, inflamed eyes or navel, etc.

She is never to put anything into the baby's stomach or give a vaginal douche unless so ordered, but ask for directions at every turn. It is not her place to use catheters or hypodermics. A patient sick enough to have this done needs the doctor personally to attend to it. The more she knows of the mechanism and accidents of labor, the better; but she cannot be expected to do much more than to promptly recognize them and send for assistance.

CHAPTER VI.

PHYSIOLOGY OF LABOR—MATERNAL.

CALCULATION OF LABOR.

THIS is very difficult to do. Few women can give the date of fruitful coitus and their tubes are swarming with spermatozoa all the time, since they are known to live at least two weeks. Nor is it possible to tell whether an ovum was instantly present for fertilization as soon as the spermatozoa had traversed their way to the tube, and lastly, were these ever known, there would be the personal peculiarity of the woman to consider. We know that gestation is very variable in most animals and presumably in the human species also.

The rule usually followed is the common one of adding seven days to the date of beginning of last menstruation and count back three months. Labor in the vast majority of cases will fall within a week before or after this date.

This supposes 280 days, ten lunar or nine calendar months, to be the period of gestation.

Löwenhardt from 518 and Leuckardt from 67 cases of known single coitus agree on 272.2 as the average of gestation; and Hosler reached the same conclusion with 280.5 days from the last menstruation, or that the pregnancy began eight days after menstruation. From available data Issmer concludes that:—

1. Conceptions occurring from the first to fourteenth day of intermenstrual life are more frequent than those from the fourteenth to twenty-eighth as 72 to 27. That is, a woman is twice or three times as liable to conceive just after menstruation, which means coitus about the time or just before menstruation.

2. Pregnancies dating from the first half are a few days shorter than those of the last half.

3. That in the first half the ovum was discharged at the last menstruation and in the last half it is the next ovum. His belief is evidently that ovulation and menstruation occur about together.

4. That pregnancy ends 268 days from conception, or 278 days from the end of last menstruation, or 281 days from the beginning.

5. That the maximum duration is 306 days, or 278 plus 28.

Frequently, however, the date of the last menstruation is not known, in which case we can approximate the date by:—

1. Date of quickening.
2. Height of fundus.
3. Settling of womb.
4. Size of fœtal ellipse.
5. Cervix changes.

Quickening is insidious and the date variable, but it is about the mid-point, four and a half months, after conception. Dr. R. Beverly Cole always claimed it to be two weeks earlier on the Pacific coast, but this has not been my experience. It has occurred as early as the fifteenth week and as late as the seventh month. Considering it as the midway point is as accurate as its occurrence would justify, and affords a good check on the menstrual date, if in doubt.

Spiegelberg gives the heights of the fundus above the symphysis as follows:—

22d	to 26th	week	8.	inches.	20. centimeters.
	28th	"	10.	"	25. "
	30th	"	11.	"	27.5 "
32d	to 33d	"	11.5	"	29. "
	34th	"	12.	"	30. "
35th	to 36th	"	12.5	"	31.5 "
37th	to 38th	"	13.	"	33. "
39th	to 40th	"	13.5	"	34.5 "

At the end of the fourth lunar month (sixteen weeks) the fundus is just above the brim of the pelvis.

At fifth month, half way between symphysis and navel.

At sixth month, at navel.

At seventh month, four fingers above.

At eighth, midway between navel and ensiform.

At ninth month, at or one inch below ensiform—its maximum height.

During the tenth month it descends to level of eighth as labor approaches.

The settling down of womb and pressure symptoms on bladder, vagina, etc., mark a preparation for labor, and are fairly constant five to ten days before that event. If there are irregular pains, it is a very sure indication, especially in primiparæ.

The size of the fœtal ellipse is very closely one-half the length of the child. Measured by pelvimeter in vagina and on fundus, the

fœtal length can be roughly obtained, and from its length about the month determined.

Lastly, in the week prior to labor pressure-symptoms develop. The vagina puffs and is varicose, the os flattens out and everts, in some cases even opens. It is equivalent to the "springing" seen in animals.

As to when labor begins is uncertain, for it is a gradual change and rarely a sudden process. In primiparæ the os is a cylinder until pains widen the internal os. In multiparæ the external os is usually patulous, admitting two fingers, the internal one finger; yet I have seen the cervix widely dilated ten days before real labor-pains. Normally, the uterine contractions should not be felt as pain any more than those of Braxton-Hicks or the action of the heart. Effacement of the cervix is the last act of pregnancy. It is not a rapid process, but the dilatation of the internal os is slowly going on for days, especially in multiparæ. A perfectly normal labor under Edenic conditions would be free from all pain. Labor contractions only differ in their effectiveness from those constantly present.

PHYSIOLOGICAL LABOR.

Labor may be defined as a physiological process whereby, at 280 days after conception, the child, now fitted for extrauterine life, is separated from the mother. I say 280 days, because that seems to be the average, practically, of all computations. It may be much extended. The Code Napoleon recognizes 300 days; in Austria, 307; in the United States it is a subject differently decided in various States upon its merits, and in one case 317 days was allowed. The exact hour and day depend on the mental and physical peculiarity of the mother and are unknown. During labor the child is entirely inert.

The rule is to add seven days to the date of the last menstruation and count back three months. This is the rule of Naegele and is sufficiently accurate, since we cannot tell when conception occurred, nor would all women probably be uniform in time. It occurs on the tenth anniversary of the menstrual period, and has led Löwenhardt to multiply by ten the days between the woman's menstrual periods. In the twenty-six-day type, 260; in thirty-day type, 300.

It is normal, or eutocia, when it occurs at the ninth month in a woman free from all organic or functional disease; with no impediment to the child by hard or soft parts of mother, with only one child in the womb presenting L.O.A. or R.O.A., and completed in twelve hours with delivery of a living child, without manual or instrumental

aid. The placenta must detach spontaneously within twenty minutes. There must be no laceration of the mother, who must remain normal for a subsequent month, and the baby for ten days. Any departure from this becomes dystocia.

The forces leading to delivery are termed "mechanics of labor" and must be known absolutely, as well as how to attend to mishaps. By mechanism of labor is meant the manner in which the child passes through the canal, the forces causing such movement, their direction and character, and the order in which they occur. It is, in fact, the whole subject of obstetrics. It is the culmination of obstetrical knowledge and must be known, or the physician will, in ignorance, try to do something wrong. In this branch of medicine more errors are made in commission than in omission; and if you can't help, keep your hands off and let the tendency of Nature effect a cure. The L.O.A. position being 97 per cent. of all births, it is considered the standard.

Obstetrics will come to every doctor and, no matter how he may specialize, he cannot avoid a few cases. In every case he is in a lime-light of criticism, for there is sure to be some woman present who thinks she knows all about it, even if she does not. It is of far more practical importance than medicine or surgery, partaking of and transcending both. While Nature will usually overcome most departures from normal, sudden emergencies may arise, requiring quick decision, cool judgment, and operative technique in poor light, without experienced help. Its proper practice demands the highest qualities of all branches of medicine. No man can be an obstetrician until he is above the average in every other branch of his profession.

SYMPTOMS OF LABOR.

For two to four weeks prior to labor there has been a sinking of the womb. Before this the head has been resting on the pelvis, but now the os has flattened out and the head is more flexed. This is more marked in the last week, and the head has settled into the pelvis. It may occur in one night and the woman find that her clothes are too loose on arising. There is no more suffering from distension, but the downward pressure gives varicocites of vulva, bladder and rectal irritability, or perhaps neuralgia of limbs if the nerve-trunks be pressed upon. When there is no such settling, be on your guard for a transverse presentation or a deformed pelvis; something is holding the child up.

For the week prior to actual labor there may be sharp, cramping

pains that last some hours and disappear. This is particularly true in primiparæ. They differ from true labor pains in being irregular, but accomplish the same thing, *i.e.*, dilatation of the cervix. You will be called again and again, but can retire until they come at regular intervals. Concomitant with these will come a show of blood-tinged mucus. It is the mucous cervical plug and vaginal secretion tinged with blood from the stripping up of the membranes that give this "show." The true labor pains, then, are regular and cramp-like, running from the symphysis to small of back or on a line from navel to sacrum, at about thirty minutes apart. They come suddenly, last one-half to one minute, and end suddenly. The pulse is quickened, and the womb can be felt to harden and become more globular

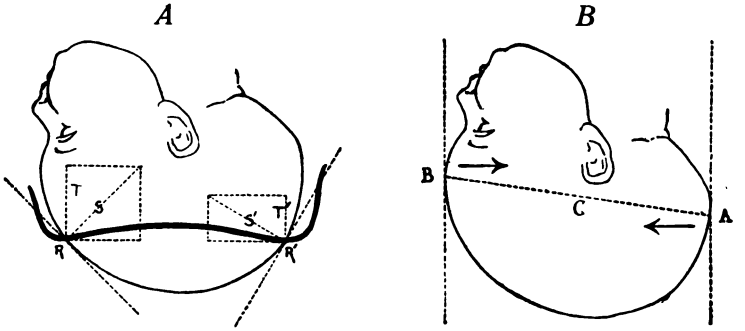


Fig. 39.—(*A*) Diagram illustrating the influence of the irregular shape of the skull in producing flexion, by the construction of the parallelogram of forces. It is seen that the force which dilates the sinciput, represented by the line *T*, is greater than the force which dilates the occiput, represented by the line *T*, which represents the sinciput.

(*B*) Diagram illustrating the secondary effect of the irregular shape of the head in producing flexion after partial flexion has once be produced. (American Text-book of Obstetrics. Saunders.)

in form. The cramping is called a "grinder" or "twister"; the patient will stop, wrinkle her face, and, catching a table or chair, lean her back against it and twist the body. These pains are felt in the cervix. They are obliterating it from above downward and stretching its fibers. There are these three signs, then, for the diagnosis of labor:—

1. Regular pains.
2. Show.
3. Dilatation of the os.

The pains may go on until the cervix is the size of a quarter, and then stop for hours. You can never tell how long a labor will last, and a wise man will not hazard a guess. For the first stage up to the full dilatation is about eight hours for a multipara and twice as long for a primipara; but there are many variations.

The pains, at first a half-hour apart, come more frequently and increase in length and severity as the amnia enter into the cervix. At the end of the first stage they are about two minutes apart and last a minute. Few women stand them with equanimity. They don't feel that they are making any headway, and for the same reason when they are much more painful in the second stage they feel that something is being accomplished and bear up surprisingly well. Now these pains are doing several things. The whole womb is acting on a center composed of fluid. The result is to drive the liquor amnii into the cervix like a Barnes's bag or dilator. Acting under the law of hydrostatics, the pressure is equal in all directions and acts directly against the sphincter. They also drive the child down into the pelvis as the direction of least resistance, thereby flexing the head. And lastly, they tend to tire out and paralyze the sphincter or cervix because it is less muscular than the fundus, and so directly contribute to its dilatation.

At first, the woman is on her feet, hands to back, walking the floor in an agitated way, stopping to twist with each pain. It is the same restlessness that compels the animal to leave the band and hunt a secluded spot. There is frequent desire to urinate or defecate, the result of this nervousness and the pressure of the head. After the cervix is well dilated she should never be allowed to go to the closet, for fear of sudden delivery and injury to the child. It is a good thing for her to be on her feet, walking. It aids in the dilatation and proper presentation of the child.

Towards the last, when the pains are about two minutes or so apart, she will want to go to bed, which should be all ready for her. You will notice a gradual change in the character of the pains. She may toss about a good deal between them, but now when they come on she will lie still. Her teeth will set, she holds her breath to emit it with a gasping cry, her eyes are suffused, face flushed, and she is groping for something to pull on with each pain. Her abdominal muscles are being brought into play and she is "bearing down." At this point she is full of complaints, begging for chloroform and "can't stand it any longer." Often the woman can be diverted during the first stage by explaining and diagnosing to her what is tak-

ing place and letting her see how necessary and normal her condition is.

After a few of these bearing-down pains the os is fully dilated, when suddenly, at the height of a pain, the membranes rupture and a gush of amnia appears. This ends that pain and is about synchronous with full dilatation. The head at once descends and presents at the inlet. There may now be a pause of some minutes before the pains start again. They are now expulsive and bearing down. She takes a long breath, sets her teeth, fixes diaphragm, and bears

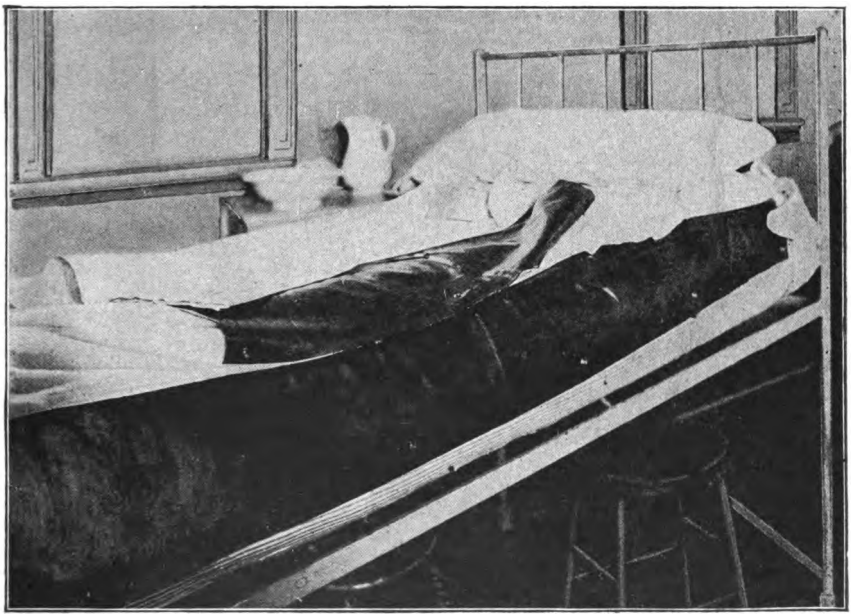


Fig. 40.—The Lying-in Bed (showing the Permanent Rubber Sheet and Sheet, and over these the Rubber Sheet and Draw-sheet.) (GRANDIN AND JARMAN.)

down with abdominal muscles. Her face and eyes are suffused and she sweats freely. If alone and up she would squat down with every pain. As the head descends they become double, *i.e.*, the pain lasts as long as she can hold her breath, when she lets it out, fills the lungs by two or three long inspirations, and again holds it and bears down. It is because the pain lasts longer that she can hold her breath. A puller of some kind should be at hand, but it is unwise to encourage her to bear down. It will only exhaust her strength, and she can't help but do it when they come.

When the waters have broken you are to examine the woman and know that no part of the child or cord is prolapsed, and determine the position and presentation. During the second stage the pains are all expulsive. For a variable time, depending upon the relative size, the head is moulding to the inlet and there is no advance. When this is accomplished it descends with every pain, retracting when it ends, but slowly and steadily gaining ground. It is not infrequent, when the head is in the excavation, for the woman to be suddenly taken with a cramp in her leg during a pain. It is caused by pressure on the sacral nerves as they lie in the grooves. Rubbing the limb will help her. The trouble is over when the head descends past the nerve. In some cases forceps may be put on to accelerate this. It is usually only transient.

At last the head has reached the excavation and rotated anteroposteriorly and begins to meet the resistance of the perineum, which bulges forward with every pain. In almost every case there is a desire to go to the toilet, which must never be allowed. Let her pass excreta into the pad, but never get up. The labiæ begin to separate more and more with every pain and the child's scalp, rolled up in a ridge, shows more and more. The perineum is stretched to its utmost. This is the very painful part of the labor, and chloroform should be given and pushed to surgical degree as the head is born. The woman should be very much awake at this time. Any tendency to sleep is an exceedingly dangerous symptom. I much prefer to hear her swear.

At last the occiput is below the symphysis and the parietals slip by the vulva, and the climax is reached of all her pain. With a cry of anguish—the "obstetrical cry"—this woman's soul sinks into the edge of darkness, as the head slowly sweeps over the perineum and another link binds together the past and future of our race. In the child is the potential of all that has been, and is to be, for good or evil.

The birth of the child ends the second stage. After the head is born there is a pause. The child is a dusky hue from lack of circulation, but this need not alarm you. Hold the head up in Carus' curve and the posterior shoulder will be born, the lower elbow drop over the perineum, followed by the anterior and body. You are now to place the baby on the right side and free its mouth from mucus, when it will begin at once to cry lustily. When the cord has ceased beating, which it will in one to five minutes, tie it with a stout ligature 1 to $1^1/_2$ inches from the navel and apply another an inch further

up, and cut between. The baby should be handed to the nurse, who will receive it in a warm blanket and put it in a place as near the body temperature as may be. The woman is now quiet and composed, free from pain, and will probably ask as to sex, condition, and perhaps marks on the baby.

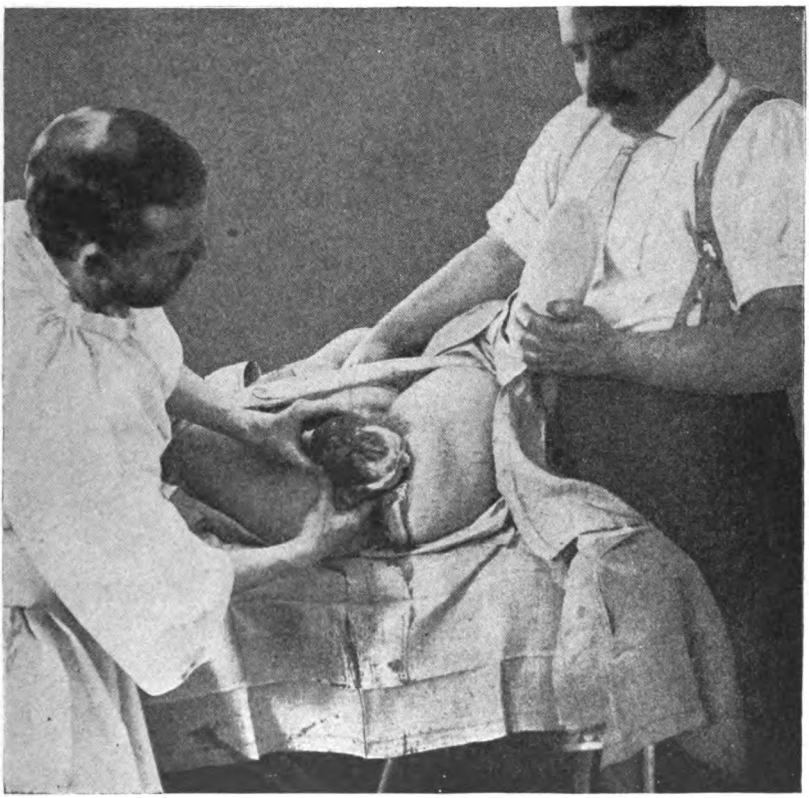


Fig. 41.—External Rotation, or Restitution. (GRANDIN AND JARMAN.)

I have observed many scenes of human emotion. I have seen men face death with fear and with bravery, I have seen the new husband's pride, the love of wife, tears of bereavement over the coffin, the sobs of orphans and the widowed. I have seen the face of the dying saint touched with a reflection from the other shore as he crossed the river, that left his face transfigured until the lid hid it from our view. I have seen the child's joyful, surprised wonder over

a new toy. But I have never seen an expression so intense, so sacred, such a blending of the divine in the human as transforms the woman's face when she hears her firstborn's cry. It takes heroism "to face the unveiled figure of Sais." Nothing but the woman's inherent power to love can sustain her. Pray God you may be to her "A very present help in the time of trouble."

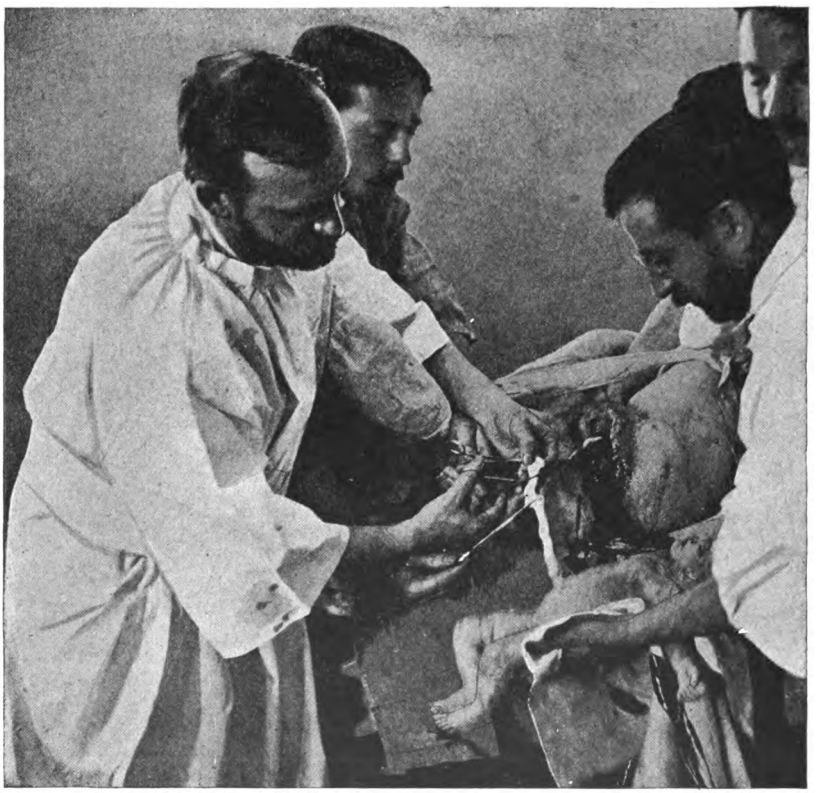


Fig. 42.—Clamping the Cord and Cutting Between the Clamps. (GRANDIN AND JARMAN.)

It is important not to tie the cord too soon. There is a residual mass of the baby's blood in the placenta. A little time should be allowed for the body to adjust its blood-supply to a medium free from uterine pressure. The hands should be kept on the fundus to note its constant contracture. In fifteen or twenty minutes a few irregular pains will come and the placenta is expressed into the lower

uterine segment and vagina, from whence it can be withdrawn. Receive it in a vessel prepared for that purpose and covered with a sterile towel, and examine it to see that it is complete. Then inspect the perineum for any laceration, and the third stage of labor is over.

Just how the placenta is detached is not known. There are three theories:—

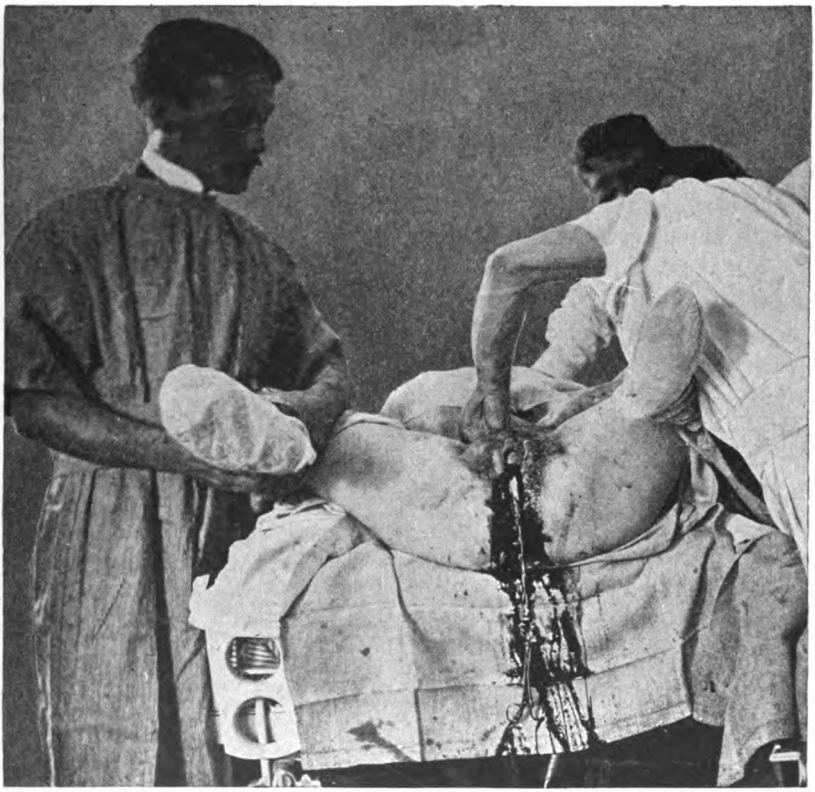


Fig. 43.—Manual Expression of the Placenta. (GRANDIN AND JARMAN.)

1. That the diminution of the area where it is attached strips it off.

2. That it is a foreign body and the detrusive action of the womb thrusts it out.

3. That effusion of blood behind it separates it and pushes it out.

The first is the most probable. The placenta is spongelike and

springy. As the child goes out, the womb contracts. This the placenta will follow to a certain point, when its own elasticity will spring it loose. Once loose, it is a foreign body to be expelled. If not removed gently, it may lodge for days. There has been some controversy as to how it comes out normally. It is normal to come fœtal surface first—Shultze's mechanism—if the cord is central as a disc; or edgewise—Duncan's mechanism—if lateral.

For one hour postpartum the womb should be very carefully watched. It is a good plan for the husband to sit and hold it up for that time; some one should.

CAUSE OF LABOR.

There have been many theories as to why labor should begin 280 days—ten lunar or nine calendar months—after conception:—

1. At each menstrual period uterine contractions are noted. This is shown in the habit of aborting. These become stronger as the womb increases in size, and are able at that time to expel the child. This was the theory of Braxton-Hicks and is but an intensifying of the contractions bearing his name. It is strange that it should act so universally in all sizes of the womb, in multiparæ as well as in primiparæ, just at this period. Again, in an undeveloped womb at five or six months, when once started, labor acts normally. But that in a womb about ready to deliver it would occur just at the menstrual anniversary is probably true. If just on the point of acting, this might well be the factor needed to start it.

2. A certain periodicity in action seen in living tissue really begs the question.

3. Hollow organs can be expanded to a certain point, when they will contract. But distention by hydramnios or twins or large children does not hasten labor.

4. As fruit ripens and cells undergo fatty degeneration and fall, so the placenta is ready for separation. This had Naegele's sanction. Some changes similar have been seen but not marked. This would only, if true, tell why the placenta was so easily separated, not why labor began. The fruit ripens under the influence of the season, which could not be the case in the placenta.

5. Heredity or unconscious habit from the earliest time. The child is best fitted at that age to live. If born before, it dies; if much after, the mother dies; so the period has tended to become fixed. This rings true and is no doubt a large factor in the case.

6. Pohlman considered the child a part of the mother until term, when it acted as a foreign body. This is a description of the result, not the cause, nor does it tell us why the child suddenly becomes a foreign body.

7. That as the child grows, more CO_2 is thrown off, which irritates the uterine motor center, but it is strange that no other center is affected and that it should act exactly at 280 days. Leopold noted thrombosis in the placenta at term and thought there was retained CO_2. Speigelberg considers it the result of some substance used by the child in its early life that accumulates during the slower growth of maturity, and finally labor is induced. But the same contractions are present, less in degree only, before conception and after delivery, and what keeps them going?

8. Lessened resistance of a softer cervix has been suggested, yet I have seen the cervix at full dilatation for two weeks before labor, and multiparæ and primiparæ are alike. Nor can it be the stronger movements of the child, for they vary within wide limits.

It may be true that the womb is more irritable, the child more vigorous, the os softer, and the head harder. There may be placental degeneration and Braxton-Hicks contraction and periodicity. Each and all may be a factor suggesting about a period of 280 days. But there is one that seems to explain better than all.

We know that heat will excite uterine action; not from the outside, but continued heat from within. It will stop a hæmorrhage and induce a miscarriage if a continuous flow of hot water plays on the cervix. Any disease that has a continued fever will induce labor.

We also know that the child is born so full of nutriment as to go three days without more, the result of increased circulation before birth. During the last few weeks it has been laying on fat and its growth has been accomplished. When the child is at last able to live extrauterine, its heart, the organ upon which all the strain of birth comes, is vigorous. It forces to the placenta more blood than it requires in its limited space for growth. An unusual supply of oxygen is on hand, which will raise the body temperature considerably above that of the mother. It acts as a continuous hot douche. The womb is sufficiently strong from supporting this weight and is sufficiently irritable to be on the verge of action. When the tenth anniversary of the menstrual wave comes, it needs but this to set up true labor. It is not at the ninth or eleventh, because evolution has crystallized it to about that time as best for mother and child.

DURATION OF LABOR.

Edgar has given the duration of labor in primiparæ as follows:—

13	hours	15	minutes,	first stage.
1	"	36	"	second stage.
		38	"	third stage.
15	hours	30	minutes.	

For multiparæ:—

9	hours			first stage.
1	"	32	minutes,	second stage.
		32	"	third stage.
11	hours	4	minutes.	

The difference is only in the first stage, between thirteen and a half and nine. It is a departure from the usual sixteen and eight. It varies in such wide range that but little dependence can be put in it for any one case.

PAINS OF LABOR.

These begin before the woman is conscious of them. A finger in the os will feel them before the woman. It is only the cervical dilatation that hurts. They last from one-half to one minute. They have been estimated to be as follows:—

One	every	10	minutes	for	1	hour	equals	6
"	"	6	"	"	2	"	"	20
"	"	4	"	"	3	"	"	45
"	"	3	"	"	4	"	"	80
								151

This would allow about one hour and fifteen minutes of pain spread over a period of twelve hours, estimating about one-half minute as the average duration of each pain. I will state that Dr. Meggs in his day figured it out forty-five minutes.

It is the general impression that more births occur during the night than in the day, but this has been proven incorrect by actual statistics. Also, Leffingwell, in tables of births for the United Kingdom for each four months during the past four decades, shows that there is a higher birth-rate in the first two quarters of the year.

MISSED LABOR.

This is a term applied to a condition where the child is dead but still retained. At the 280th day, or completion of term, regular but feeble labor pains begin and then subside. It is a curiosity only.

UNCONSCIOUS LABOR.

Aside from drug narcosis, it is possible for a woman to be delivered unconsciously during sleep. There are very wide variations in the amount of pain attending labor. In general, pain is the penalty exacted by civilization, but there is a marked lessening of susceptibility to pain that is one of the preparations for labor. There are many instances where the woman was awakened by the movements of the child, which was born during her natural sleep.

FORCES OF LABOR.

These naturally divide into involuntary and voluntary. The first are uterine contractions, peristaltic in character. They occur regularly, begin slowly, reach a climax, and rapidly decline—the whole lasting about one minute. In the first stage they begin about thirty minutes apart. At the second stage they are only two minutes apart and there is a steady increase in their severity. The muscle-fibers of the round ligament also partake in this contraction, drawing the fundus forward and downward. This action is a feeble one, but assists in bringing the womb to a point where the abdominal muscles can act. While the woman cannot stop the pains, they can be inhibited reflexly by emotion. A continuous pain would kill the child. Being interrupted, its circulation is not interfered with and the womb-muscles get rest and relaxation, except at the cervix, where the membranes hold all the dilatation gained.

The force is generally proportionate to the resistance to be overcome, modified by time, fatigue, etc.; but if there is little resistance, the pains will remain even. The force varies with the shape of the ellipse, and the most favorable is the vertex presentation, where the womb has the soft breach to contract upon. In a shoulder or transverse they will be irregular. The womb will not injure itself at first.

Schatz, by using a dynometer, found the contraction equal to a raise of from twenty to a hundred millimeters of mercury. From this and the fact that Duncan has shown the membranes only capable of standing at the outside thirty-seven pounds to the square inch, it is estimated that the pressure cannot be over fifty pounds to the square inch. Experiments by Poulett show that ninety pounds injure the child, and it must be considerably less than that.

During the pain the blood is forced from the womb into the general circulation, and both pulse and arterial pressure rise. The woman's temperature is higher and perspiration profuse. She is in every sense in labor.

False pains are regular pain contractions, mainly seen in primiparæ for a few days, never a week, prior to labor. Mental worry seems to predispose to them, and rest in bed favors their disappearance. In primiparæ, though the os may dilate somewhat, there is rarely any show.

The pains of labor start at the os and travel over the fundus in a wave. The bulging of the membranes can be felt several seconds before the woman feels the pain. The os relaxes before the fundus reaches its maximum contraction, and the height and last part of the pain is expended directly in stretching those fibers. The effect of the preliminary cervical contraction is to lift the head and prevent engagement while the amniotic fluid settles under the head; then, as the fundus forces the head down, there is found a water cushion ahead of it. The whole surface of the womb is a hydraulic press acting on the cervix. It is the stretching of the cervical fibers that causes the pain. During the pain the womb rises, flattens, and also slightly twists on its axis. It rises because the circular fibers are stronger than the longitudinal.

Were the womb equally muscled throughout there would be no cervical dilatation; but this is not so, for the lower segment is much the weaker and at first yields equally until the cervix has opened a little. When once the fluid has entered the cervix it exerts a pressure at right angles, directly in proportion to the convexity of the bulging; for a fluid force is expanded equally in all directions and therefore at right angles to the cervix.

Water is practically incompressible and is the ideal substance for dilatation. The best force to drive a line is a solid, but the best force to drive a plane is a liquid.

Should the membranes break prematurely, then the cervix must be dilated by the head, *i.e.*, a cone, which does not exert its force at right angles. Such a "dry labor" is of necessity slow and tedious.

There is not much said in the text-books on this very common condition, viz., too early rupture of the membranes. Perhaps in 10 to 15 per cent. the waters break in the first half-hour of labor-pains, but enough is usually retained behind the head to answer every purpose. A "dry labor" is a real menace to the child from asphyxiation, meningeal hæmorrhage, as well from the maternal exhaustion and œdema. There is always a caput on the child's head. Danger to the child will be shown by its extra movements, which mean asphyxiation, and the passage of meconium, or a rapid fœtal heart or an excessively slow

one. In these cases the cervix must be dilated manually and the child extracted, though from the lack of fluid present version, from its difficulty, will be contraindicated.

The dilatation of the cervix is not, however, all mechanical, but into it enter elements that are physiological.

1. It is tired out and relaxed from an overwhelming force constantly applied.

2. The pressure of head and water interferes with blood-circulation and it becomes œdematous. A serous infiltration separates the fibers and they fail to act connectedly on lines of greatest efficiency.

3. The action of the longitudinal fibers is to pull up the cervix over the head.

In some cases there is an unusual rigidity of the cervix. I know of nothing so good as five grains of chloral hydrate, which seems to have a selective action, as well as quieting the restlessness and nervousness incident to a long delay. And if the patient sleeps for a few hours it is a good thing, for the os is softening all the time, and with rest and renewed vigor the completion is usually easy.

With the break of the membranes the head descends and acts as a ball-valve, holding the surplus behind. What fluid is left now only prevents the force of the womb from being expended on some prominence—it equalizes it. The head is moulded, and in its descent meets the resistance of vagina and vulva. These it mechanically stretches on a cone, as it were, which is lubricated by the discharge. The bony walls act as directors, in every case having a soft part opposite which conserves the head and springs it back between pains and which also aids in further flexing the head.

The head is both hard and soft. It will stand pressure, and yet is capable of moulding. Only the base and face are rigid and so formed that any plane from front to back is a cone when moulded.

When the cervix is not dilated by the liquor amnii, and the head, by engaging, takes off the force of the pains, should there be any failure of the head to advance in time under two hours, the fundus will overcome the resistance of the fibers next to the cervix, *i.e.*, the lower uterine segment, and a sharp line is formed, the ring of Bandl. When this is seen a rupture is imminent. Two hours of labor with no advance of the head should call for prompt treatment.

During the first stage the voluntary muscles of the abdomen may be used, but this is not to be encouraged. In the second stage they are beyond her control and are truly involuntary. The diaphragm is fixed by a long inspiration and the woman leans forward and bears

down by the contraction of the abdominal muscles. As stated, these are double toward the end of labor. It has been noted in animals that when the abdominal muscles have been severed, the uterine force is still able to effect delivery.

Now, while the action of abdominal muscles becomes involuntary, this action can be largely prevented by rapid breathing. Many women find this out for themselves and simply will not bear down, rapidly panting when the pains come on. At the birth of the head it is sometimes advantageous to have the woman breathe full and fast, to prevent precipitate birth and laceration.

The abdominal muscles do not become involuntary until the womb has so far contracted by the expulsion of the child that they can act. For months they have been distended, and until this distension is relieved they do not act effectively. When the pressure is reduced they act with greater and greater efficiency, until, at the birth of the head, they are the main force of labor, far overshadowing the force of the womb, which, however, still continues.

The effect of chloroform is not to materially alter the character of the contractions unless pushed to a full narcosis, when it will relax the womb, as it does every other contractile tissue. Used to the point of rendering the pains bearable, or just to unconsciousness, it has no action in suppressing them. This is termed the obstetrical degree.

The effects of the uterine contractions are to diminish the area of its cavity, while the action of the abdominal muscles not only does this, but pushes the fundus downward as it settles and holds it down, preventing recession.

STAGES OF LABOR.

These are, first, dilatation of the cervix; second, delivery of the child; and third, expulsion of the placenta.

The first stage begins with the first regular pain and ends with full dilatation, which should be the time of the rupture of the membranes and engagement of the head.

Prior to the first stage there have been some preliminary changes different from the normal course of labor, and almost worthy of being classed as a distinct stage but for the vagueness of the symptoms and their uncertainty. This preliminary state begins a week or ten days before the regular pains and is marked by a sinking of the womb.

During this time the external os is flattenening out and the internal may even be considerably dilated, one or two fingers. The

irregular pains are most marked in primiparæ. The sinking of the womb is due to flexion of the head, which is now partially engaged, and, pressing upon the bladder and rectum, gives the former especially great irritability, as shown by frequent urination.

Because of this sinking the woman can breathe easier, her waist is reduced, and whereas before she had her clothing lengthened out by strings, she can now almost button them. This pressure also renders the vagina and the vulva œdematous and violet in color. The direction of the cervix is much posterior and hard to reach.

Fig. 44.—Washing the Eyes of the Fœtus Immediately After Delivery. (GRANDIN AND JARMAN.)

The first real stage being ushered in by regular pains, the body of the child is flexed by each contraction, while the head swings freely and tends to bore down until adjusted to the easiest position, namely, the oblique diameter. Flexion has been said to be a normal step in delivery, but the child is passive, and after labor has begun there is no evidence of any more flexion than just before.

The first stage may last a few hours or for days. This is modified by the size of the child in the pelvis, position and presentation, age,

amount of liquor amnii present, habits of life, and many unknown causes. There may be vomiting and chills that mark a nervous shock. "One old hen" remarked to me that at such times she could neither "lay nor set." With full dilatation the membranes rupture and the head descends and engages.

The second stage then begins with full dilatation. The obstruction at the plane of the cervix being overcome, the womb now acts directly to expel the child. There are several resistances to be overcome. First, the head must be moulded to the superior strait. But a few pains are usually required for this; in fact, the head may almost immediately start to advance. It has next the vagina to dilate, and, when the head is in the excavation, internal rotation to perform. When this is accomplished the resistance of the perineum has to be slowly overcome by dilatation also. The lower the fundus sinks, the better can the abdominal muscles exert their force and they are more and more brought into play. After every pain the head springs back, but never quite to where it was, until the occiput is under the arch of the pubes. From this point it advances steadily with every pain. After the birth of the head there will be cessation of pain for a few minutes, when they resume almost as one continuous cramp until the posterior shoulder and arm are born, when the rest of the child slips out so rapidly as to have no describable mechanism. Pains cease with the birth of the baby for five to twenty minutes, when they resume to expel the placenta.

Third stage. The womb firmly contracts when the body is born and the placental site is reduced from 20 by 15 centimeters (8 by 6 inches) to 10 by 8 centimeters (3 by 4 inches). The placenta is not separated at the birth of the baby, as a rule, but is crowded together and condensed. The first few subsequent pains, however, probably the first, loosen it, and a few more expel it into the lower segment, cervix, and vagina, from which it should be gently drawn. The placenta will not be loosened or expelled until these pains come.

During the third stage there is often a chill, which is due to nervous relief of tension, wet and slop, and exposure to air and chilling of the skin from evaporation of perspiration. It is a signal for you to expedite matters and clean the woman up. It never seems to cause any trouble.

The placenta normally comes out fœtal surface as a disc, with its membranes trailing behind. There may be effusion of blood behind it if the body was not firmly contracted, which, involving some loss of blood, is a conservative action in that it increases the bulk of foreign matter in the womb and hastens its contracture. Normally

the mother loses but little of her blood when the placenta comes away; the most of that lost is the blood of the child remaining behind the ligature in the placenta and cord. This is borne out by the fact that when the ligatures are not put on until the cord ceases to pulsate there is much less blood on the pad.

The placenta should be examined—if not at once, at least before leaving the house. This should embrace the integrity of the membrane, that none be left behind, and that the placenta is entire. Should any vessels run from the cord out to the edge, of a large, even caliber, it is probable that there is the anomaly (placenta succenturiata) of a secondary placenta. This is normally found in many animals, and in man as a reversion of type. This must not be left behind in the womb. Often you will be asked what disposal to make of the placenta. It can be put in one hole of an ordinary stove and burned with but little trouble.

Now, under no circumstances must force be used on the cord to remove the placenta. It will come out spontaneously, and the rule is to wait thirty minutes before attempting manual removal, which is one of the most dangerous of operations. I cannot too severely condemn the practice some have of "going after the placenta as soon as the baby is born." There is a physiological time for it to separate that should not be violated. It is a foreign body and will be expelled when the womb is rested and its contractile power regained. That it does not expel it at once is proof of its unfitness for the act, and it is to invite danger at any time to violate natural law. No glove or hand is wholly aseptic, and the manual removal of the placenta should be done with fear and trembling—and is by those who know what they are doing. The Crédé method should be done or at least the womb held in every case. In the Crédé method the womb is kneaded until a pain and then pressed down; the Dublin method is the same without kneading.

After half an hour there is danger of the os contracting enough to hold up the placenta like a button in a buttonhole, and it is better to go up and pull down one edge. This is not a manual removal and is allowable.

The so-called hour-glass contraction I have never seen and am very skeptical of its existence; on the other hand, it is not unusual in cases attended by midwives to see the placenta lodge, as it were, at the vagina and there remain for some hours, or until turned and removed. Adhesions of the placenta to the uterine wall requiring manual removal are very rare and dangerous. They must be stripped up from the edge without tearing the womb wall.

CHAPTER VII.

THE PHYSIOLOGY OF LABOR—FŒTAL.

ATTITUDE OR POSTURE.

THIS is the relationship of the parts of the child to itself as a whole. Normally, it is one in which all the parts are flexed; any extension whatever is a departure from normal, and therefore has in

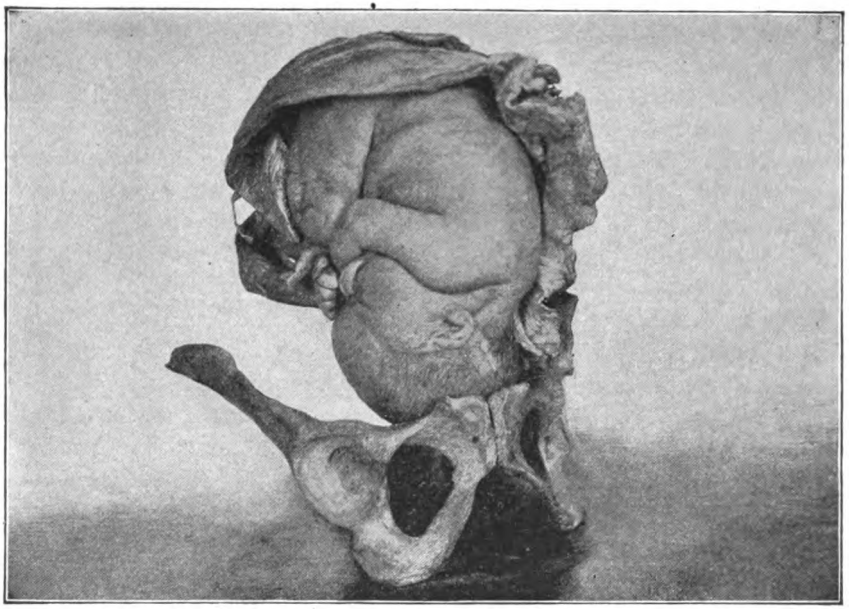


Fig. 45.—Presentation of the Vertex. Left Occiput Anterior.
(GRANDIN AND JARMAN.)

it the element of a dystocia. In flexure the child is but following out the curve of its development over the yelk. Later, the ventral surface conforms to the curve of the mother's back, and all parts, by flexion, occupy an egg- or olive-shape in the least possible space. The long axis compares with the long axis of the womb, head down, from Payot's law, which is that "when a solid body is contained in another, if the container is the site of alternate movements and of rest, if the surfaces are slippery and not angular, the contained constantly tends to accommodate its form and dimensions to the form and capa-

city of the container." The flexors are stronger than the extensors (in fact, remain so during life), and the child adjusts itself in the smallest possible space to the best position.

PRESENTATION AND POSITION.

Presentation is the part of the child that is prominent at any part of the birth-canal usually applied at the inlet, and as the os roughly marks the center of that plane, it is the same as saying it is the relationship of the child's long axis to the axis of the birth-canal.

It is used in still another sense, as the part which strikes the

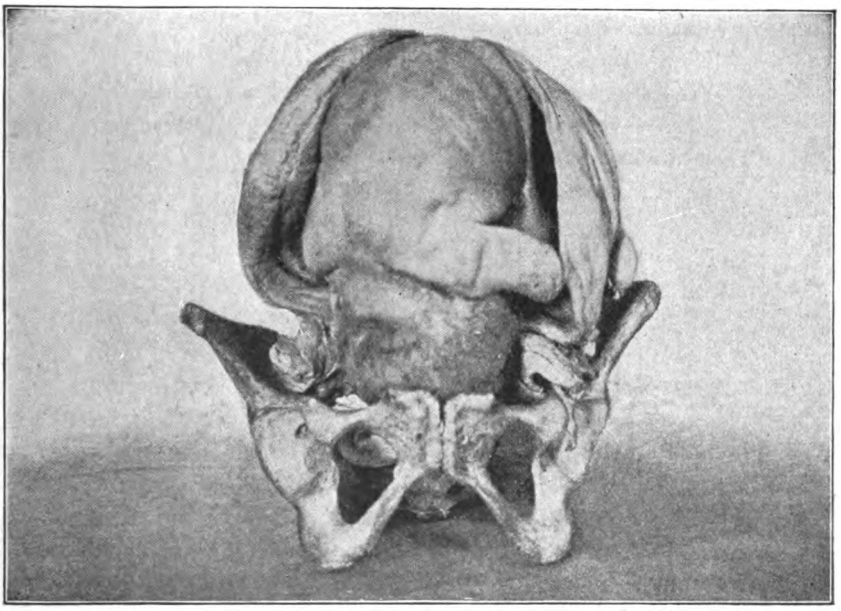


Fig. 46.—Presentation of the Vertex. Right Occiput Anterior. (GRANDIN AND JARMAN.)

examining finger not only with reference to the axis of the child, *i.e.*, the pole presenting at the inlet, but also with reference to its position. Any part of the child may present; but when we say the brow presents, we mean more than that the head of the child is down, we mean the position of the child is in extension. We have no term to express whether the head or cephalic pole presents as first illustrated, and so combine two separate ideas under the single term presentation.

Position refers to the relationship between the part that presents and the diameter of the plane of the inlet. The mother is taken

as the fixed point from which to name, and the prominent part of the child that presents is used. Position is then horizontal rotation around the long axis of the child. Left occiput anterior means that on the left side of the mother the occiput of the child lies, and that the occiput is front. It also tells us the attitude; that, the occiput being down, the head is flexed; that the cephalic end presents; that the occiput presents and that it is in the first position.

Considerable confusion exists in the nomenclature of positions. The Germans consider the posterior as variations of the anterior. In the United States and England there are considered to be six positions. They are named as follows: The presenting part of child, as vertex, is taken. We then have:—

First—vertex left.	Fourth—forehead left.
Second—vertex right.	Fifth—forehead right.
Third—vertex front.	Sixth—forehead front.

Presentations are as follows:—

Cephalic	vertex.
	brow.
	face.
	chin.
Caudal	sacrum.
	calcaneum.
Transverse	shoulder left.
	shoulder right.

To any of these presentations one of the six positions may be applied except in transverse, when there would be no third or sixth position. In France they leave out the third and sixth. In France and Germany the oblique diameters of the pelvis also take their name from the front; in England and the United States, from the back—"right back."

To avoid confusion it is better to letter the positions, and since the third and sixth are of such rarity they may be ignored. These, then, cover practically all the positions:—

Of the occiput or vertex.	1. L.O.A. occurs in 70 per cent. of cases.
	2. R.O.A. occurs in 10 per cent. of cases.
	3. R.O.P. occurs in 17 per cent. of cases.
	4. L.O.P. occurs in 3 per cent. of cases.
Of the face.	1. Left mento-anterior, second in frequency.
	2. Right mento-anterior, third in frequency.
	3. Right mento-posterior, first in frequency.
	4. Left mento-posterior, fourth in frequency.

Brow.	1. Left fronto-anterior. 2. Right fronto-anterior. 3. Right fronto-posterior. 4. Left fronto-posterior.
Of the pelvis.	1. Left sacrum-anterior. 2. Right sacrum-anterior. 3. Right sacrum-posterior. 4. Left sacrum-posterior.
Of the heels.	1. Left calcaneum-anterior. 2. Right calcaneum-anterior. 3. Right calcaneum-posterior. 4. Left calcaneum-posterior.
Of the shoulder.	1. Left scapula-anterior. 2. Right scapula-anterior. 3. Right scapula-posterior. 4. Left scapula-posterior.

The frequency of presentations, referring to poles of the ovoid, is cephalic in 96 per cent. of cases, breech in 3 per cent.

As regards attitude of the child, brow and face are about three-fourths of 1 per cent., transverse axis (shoulder) is one-fourth of 1 per cent., and many of these alter when the pains become effective.

Why the head is down in 96 per cent. of cases has been a greatly debated subject. It is usually so even before the placenta is attached. At third to seventh month Edgar found 50 per cent. cephalic, while at seventh month Churchill found 83 per cent. and at birth 96 per cent. It would seem to be, therefore, the result of some constant agency tending to this result and acting progressively; yet with the increase of abdominal tension there tends to be a fixture of the child to any given position. It is probable that the weight of the upper part above the navel, which is heavier than the limbs, by the force of gravity assists in this. The child in kicking would in caudal presentation have a bony pelvis to start from and this would change the head a little, starting the turn, and it may be that when the head is down the heart furnishes a better blood-supply to the brain and the child is easier, whereas if upright, there would be the lift on the heart. The lower segment is softer and lies rigid, and tolerates the head better, perhaps; or the fundus may contract down on the softer breach. Aiding in the change is the pear shape of the womb and the upper part allows more room for the limbs to move in. The head is also on a ball-and-socket joint, and, the upper part of the

womb being movable, the head may turn to one shoulder and version be done; but when the head is once in the pelvis, the neck corresponds to the point of beginning motion of the womb as a whole. Again, the womb contracts from every part towards the os. Acting on the movable head, it tends to bend it over and turn. Once the head is in the pelvis, it sinks into the outlet. At birth, frozen sections show the head 2.5 inches below the inlet. The joint at the neck is then so near the fixed point that it does not interfere with the contraction of the womb, and the body of the child is free to swing from

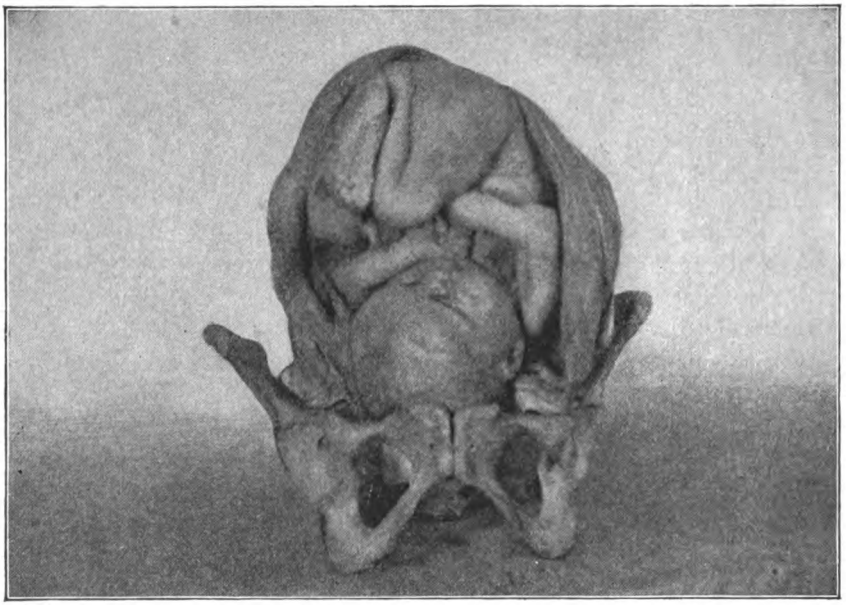


Fig. 47.—Presentation of the Vertex. Left Occiput Posterior.
(GRANDIN AND JARMAN.)

side to side with the womb as a whole. A retaining force in the later months is the relative increase of the child to the liquor amnii. At first there is relatively more fluid and the child easier changes its position; later, it is forced to stay where it is. Some or all of these cause the phenomena. In all the presentations the first and third positions, *i.e.*, the mother's right oblique diameter, has the higher percentage for that group. That the posterior part of the child is in front is due to the curve of the vertebræ, the ventral surface being best fitted to conform to the lumbar curve; but why a symmetrical head should take the left plane rather than the right, 87 to 13, is not so obvious.

The pressure of the rectum on the left side narrows the left oblique; the aorta is on the left side, and the woman unconsciously lies on the right side to escape pressure there; again, the intestines are fastened obliquely in the right fossa and lie behind and to the right of the womb, and so direct the fundus to the right and turn it until the right cornu is anterior; and it is possible, too, that the usual habit of sleeping on the right side, the better to empty the stomach, may affect the womb by gravity. I have no very accurate statistics; but what I have, show the R.O.A. to be much more common

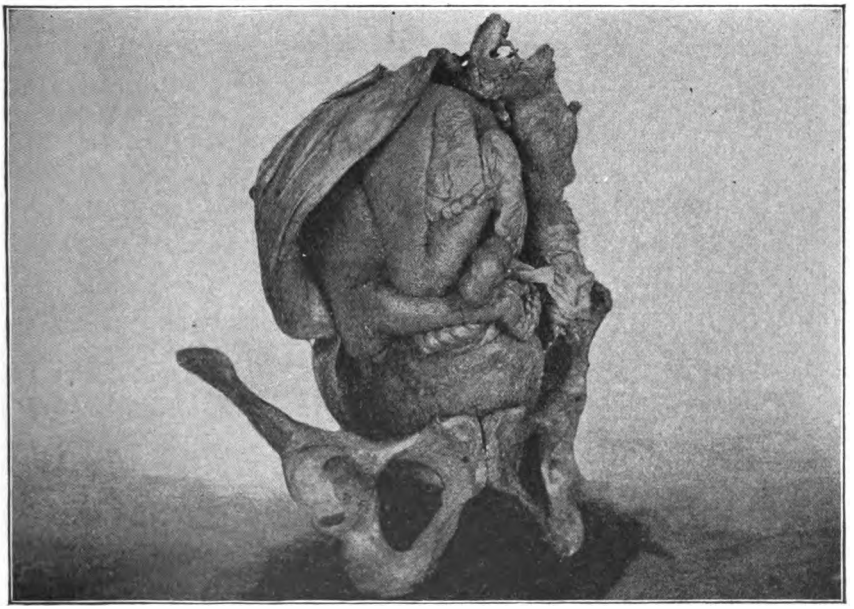


Fig. 48.—Presentation of the Vertex. Right Occiput Posterior. (GRANDIN AND JARMAN.)

than the 10 per cent. of cases usually given. The normal labor is L.O.A., and this is considered the type. Departures in flexion of the head cannot be changed after the membranes have ruptured. The further the departure, the more dangerous, until the combination of face and chin posterior is reached, when absolute impossibility of birth is marked. The chin must come front in all face cases, or the shoulders enter before the occiput is born and the head is locked. The distance from the promontory to perineum is greater than the chin to the sternum.

Description of Different Presentations.—Madam Boivin gave the following:—

L.O.A.,	15,693,	equals 80.1	per cent.
R.O.A.,	3,682,	equals 18.8	per cent.
Front,	6,		
R.O.P.,	109,	equals .55	per cent.
L.O.P.,	92,	equals .47	per cent.
Back,	2,		

The reasons why the L.O.A. so greatly predominates over all others are various. First, the obliquity in nineteen-twentieths of the

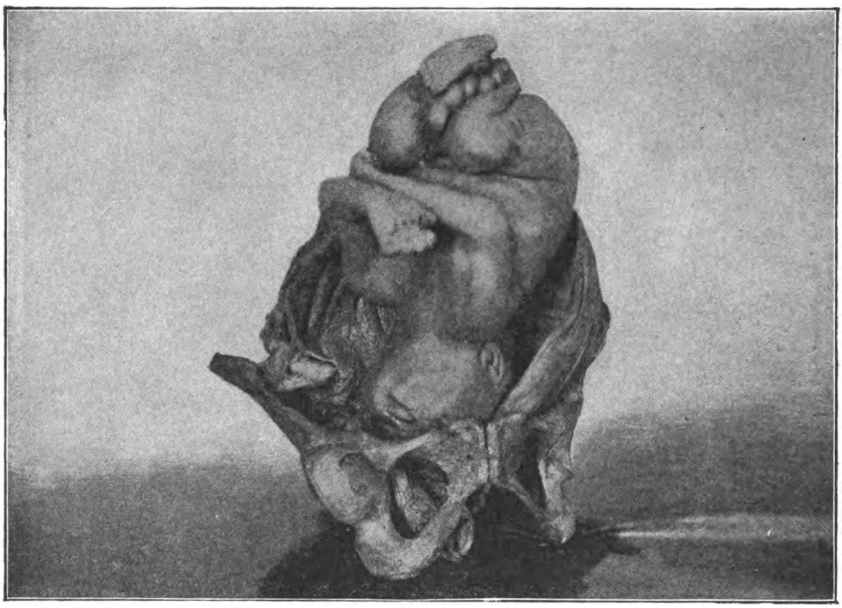


Fig. 49.—Presentation of the Face. Right Mento-anterior.
(GRANDIN AND JARMAN.)

cases of the womb. This is due to the rectum being on the left, and the attachment of mesentery.

In L.O.A. the fœtal back is to the left side and extremities to the right. The sagittal suture is oblique on the pelvic right oblique. The heart is best heard in the left lower quadrant of abdomen. The small fontanelle presents and the occiput is overlapped by the parietal bones. The suboccipito-bregmatic plane of the head, with a circumference of thirteen inches, is parallel to the plane of the inlet.

MECHANISM OF LABOR (VERTEX).

The mechanism of L.O.A. is to be considered under the heads of:—

1. Flexion.
2. Moulding and engagement.
3. Descent.
4. Internal rotation.
5. Propulsion.
6. Extension and birth of head.
7. Restitution.
8. Rotation of shoulders.
9. Descent of shoulders.
10. Birth of posterior shoulder.
11. Straightening of body.

Flexion is the result of the uterine force acting on lever arms of unequal length and also the springlike action of the right sacro-iliac on the chin. This occurs before labor and is increased by the pains.

Moulding.—This means that there is resistance. The bones overlap and the head is inclined a little to conform to the back curve of the sacrum, for the prominence is higher than the symphysis. Engagement partially occurs before labor; that is, a tangent to the vertex is lower than the plane of the superior strait. It is especially marked in primiparæ, from the tone of the abdominal wall. It will not be present when any diameter presents larger than the vertex, *i.e.*, in brow, face, transverse, or anomalies of position. The moulding of the head does not involve the face or base, nor does it greatly alter the capacity of the cranium, but it is probably true that a certain small portion of the cerebro-spinal fluid is displaced into the cord. This moulding may greatly disfigure the child for a few days, but will not be permanent and is usually harmless. The maternal fear of idiocy can be safely assuaged in most cases. Moulding will shorten the transverse diameter two-thirds to three-quarters of an inch; the lowest parietal overlaps the occipital.

Descent.—The same force having moulded the head now causes it to descend on to the pelvic floor by extension of the neck, the body of the child being practically in the same place. The head descends on the anterior plane.

Internal Rotation.—While the spiral anterior plane is two-fifths of a circle, the head only rotates forty degrees, or one-ninth of a circle. It is always partially inclined and the plane has but little to

do with this rotation, which does not occur until the head is on the floor of the pelvis, when it rotates to conform to the anterior-posterior diameter of the outlet. This rotation is the result of

First.—The spiral shape of the pelvis.

Second.—The pyriformis muscle, arising from the front of the sacrum by three digitations and going out of the sacral foramen, is a resistant mass which, from its obliquity and size, gives more room at this level in the anterior-posterior diameter as well as directing the face to the rear.

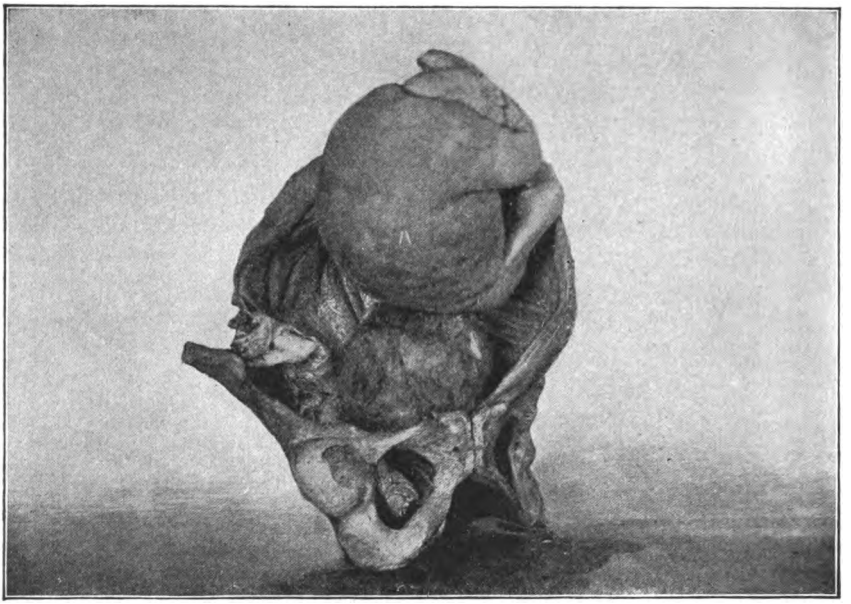


Fig. 50.—Presentation of the Face. Left Mento-posterior.
(GRANDIN AND JARMAN.)

Third.—The pelvic floor is so sloped that any body striking it is directed forward under the arch. This is probably the predominating factor in rotation, and not the planes as once thought. In fact, every case becomes anterior from the perineal resistance alone when nothing interferes with its action. Rotation does not occur until the head is on the floor. This pelvic diaphragm is more resistant behind than in front, and on the sides than in the middle. Following the line of least resistance, the head obeys the law that whatever part of the child first meets the resistance of the pelvic floor is turned forward and upward under the symphysis.

The uniform force would not admit of rotation were there not more room in the excavation than at the superior strait. This rotation must occur or birth would be impossible. This floor resistance also flexes the head, because it is greater behind on the brow than in front, and, while retarding the brow as it were, the occiput is forced to the front in the reverse direction. The more fully flexed the head, the more the perineum does the rotating. In case of a brow where there is poor flexion the pelvic action is more pronounced, as follows:—

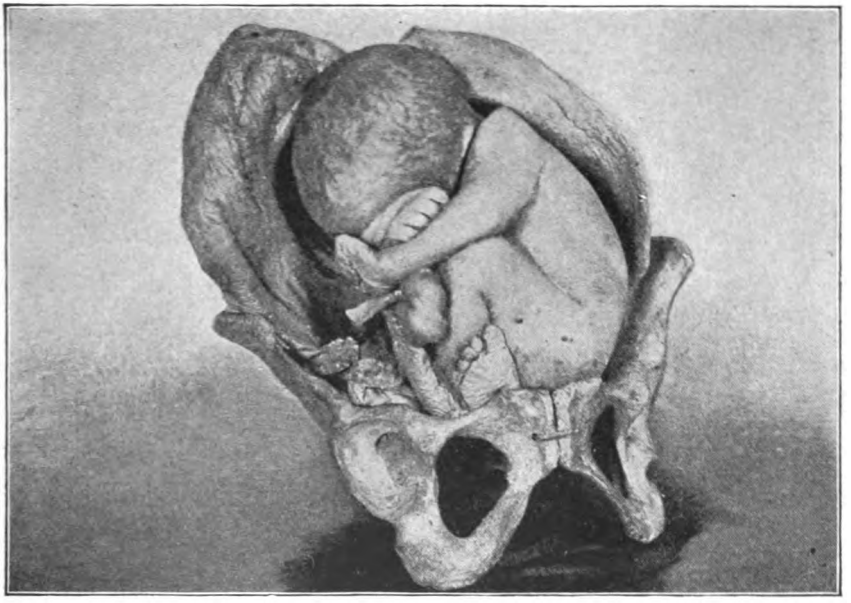


Fig. 51.—Presentation of the Breech. Left Sacro-anterior Position. (GRANDIN AND JARMAN.)

The occiput being on the anterior plane, the forehead is in the deep sacro-sciatic notch and held fast. The only motion possible for the head is descent, and the occiput is thereby more easily influenced by the groove, which is constantly more pronounced as it descends, and the head cannot go back against the iliac spine. A little more descent and the brow is below the promontory of the sacrum on a shallow and broad surface, free to move in only one direction, backward, as the occiput can only go forward. It will do this until the opposite pubic rami press equally on the head. The parietal bosses now are applied to the tuberosities of the ischium. The

head descends, but is flexed by the brow being the long arm of the lever, and the greater resistance of the posterior part of the perineum. In cases like this, of poor flexion, rotation is the result of the pelvic planes far more than when normal flexion is present.

Propulsion.—Propulsion of the head, directed by the perineum, and by it kept well flexed until the occipital protuberance is free from the arch of the pubes, is the next step in mechanism.

Birth of the Head by its extension, the face sweeping over the

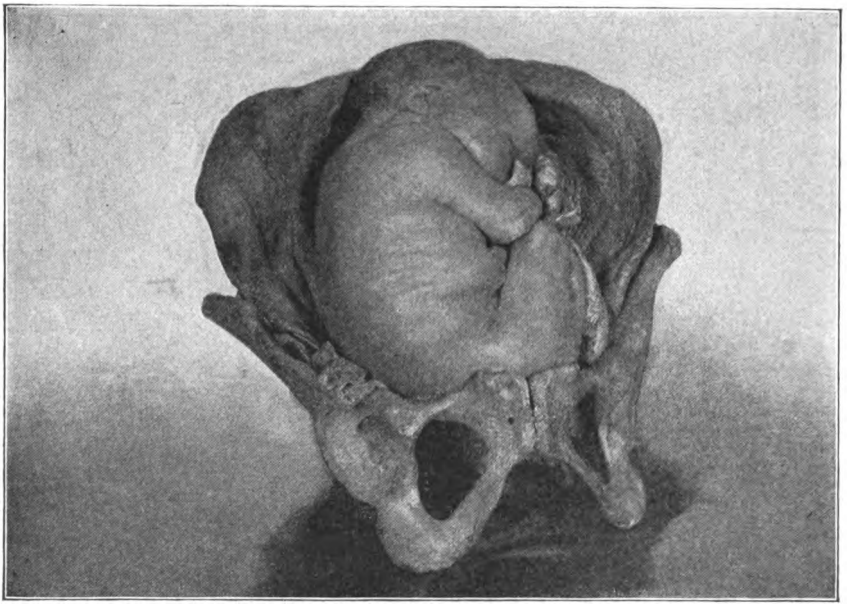


Fig. 52.—Presentation of the Breech. Right Sacro-posterior Position. (GRANDIN AND JARMAN.)

perineum. Examination will show that the distance from the neck to the brow, face, and chin is equal, and when the occiput is born it marks the maximum perineal distension. Extension is the result of the force acting on one arm of the lever alone. When the occiput is born, the perineum holds the neck firmly up against the arch and it cannot advance any more, but the long arm is free and the result is extension.

Restitution is the rotation of the head on the neck to conform to the shoulders, that are now engaged on the opposite oblique diameters from which the head descended. The head has to restore not

only its own turn to the front, but also that of the shoulders. External rotation of the head is therefore just double that of the internal, or eighty degrees, nearly a right angle.

Rotation of the shoulders as they descend into the pelvis.

Descent of the shoulders and their internal rotation to the front, exactly as did the head, but in the opposite direction, comes next.

The next step is the birth of the posterior shoulder and arm, the baby being curved laterally to conform to the curve of Carus.

The posterior shoulder and arm being born, the body straightens, which delivers the anterior shoulder, and the body follows without mechanism.

These are the steps normally followed in an L.O.A. In R.O.A. the process is identical, except substituting the right for the left plane throughout. These are the types of eutocia.

It will be readily seen how much the tonic action of the pelvic diaphragm enters into normal labor. As before mentioned, it is like a scoop-shovel in shape, directing, by its angle of refraction, everything under the arch. Like the shovel, too, it is strong at the handle and sides and flexible at the tip. It is in reality horseshoe in shape, strong at the toe, which is posterior, and weak at the heels, with an opening, which is the vagina, between. It must also be remembered that the head is freely movable on a ball-and-socket or toggle joint, and that its long diameters will tend to accommodate to the long diameters of the pelvis.

CHAPTER VIII.

MULTIPLE PREGNANCY.

1. Twins.
2. Triplets.
3. More than three at birth.
4. Superfecundation.
5. Superfœtation.
6. Uterine and ectopic.

TWINS.

Twins occur about once in every eighty-nine pregnancies. The tendency is markedly hereditary, transmitted through the maternal side. They are of two types: First, the fertilized ova from separate Graafian follicles that simultaneously rupture, in which case each develops independently, having its own placenta, cord, and membranes. Second, two germ-spots in one follicle, analogous to the double-yolked egg occasionally seen in chickens, in which case there will be one placenta, two cords, and but one set of membranes. The children will be strikingly alike and be of the same sex.

In the first, the placenta may be fused and appear superficially as one, but will show a line of demarcation in some way. In the second, there is always some anastomosis of the placental vessels. Shatz is led to the conclusion from this that it is the common cause of acardiac monsters. At an early period the heart of one child is stronger than the other and monopolizes more of the placenta common to both. The other receives less and less blood, and atrophies. The weaker twin only receives enough to develop the lower extremities. The stronger twin is also surrounded by the larger bulk of amnia.

They may be, then:—

1. One ovum from each ovary.
2. Two ova from one ovary.
3. Double ovum.
4. A division of a single blastoderm into two, in which case they will be monsters.

Ahlfeld places the frequency of occurrence of the type of two fertilized ova from separate follicles to two germ-spots in one follicle as five and one-half to one. Sabatta is unwilling to admit that two

female and male pronuclei unite, but considers these as cases of cleavage of the blastoderm, which has been done experimentally in animals. Two ova in one vesicle have been actually seen, however.

The decidua vera is always common to both in every case.

In twins the decidua reflexa will be single or double, with the chorion according to the placenta. The chorion and amnion are originally double, as they are of fœtal origin, but often fuse into one cavity. It is because of the possibility of twins and fusion of the placenta that we tie the maternal end of every cord.

One child may develop more than the other to any extent. It is not uncommon for one child to cease its development and die and be delivered at term, pressed flat by the pressure of the fluid against the womb wall. Such a condition causes the fœtus papyraceous.

A multiple pregnancy is shorter by some weeks than normal. The pressure symptoms and enlargement are greater. Abdominal palpation will give the outline of two heads, and auscultation two fœtal hearts. A large child and hydramnios may give the distention but not the outline of twins or the two hearts. They usually conform to each other, head and breech.

The mother is apt to have some of the toxæmias of pregnancy, abnormal presentation, or postpartum hæmorrhage from sudden emptying. She is also subject to prolapses and locking, as one child usually presents by the breech. It is therefore a dystocia, and the accidents will be considered under that head. The majority of cases, however, are normal and even easier than normal labor, because the children are individually smaller, although their combined weight is greater than a single child by about a half.

TRIPLETS.

Triplets occur about once in 89 times 89 pregnancies, and are very uncommon, therefore. What has been said of twins applies to triplets. It is, however, very rare for all three to live; one is usually still-born.

More than triplets have few authentic instances, though six have been born at once.

SUPERFECUNDATION.

Superfecundation is the impregnation of more than one ovum by different acts of coitus. This could not be told unless from the color of the male. There are many cases on record where twins have been born of a white woman, one-half black and the other white; or

of a negro woman, one-half white and the other black. It is probably true that many of these cases were really of one father, but a reversion of one twin to the color of some ancestor.

SUPERFŒTATION.

Superfœtation is the impregnation of two ova, but at different times, even months apart. This may be accounted for by a uterus septus, or pressure-atrophy of one twin. Still, there seem to be well-defined cases of simultaneous development of children of unequal age. It will result in:—

Both being born at one time, one being undeveloped; or,

Both born at term, but some time intervening, which presents many difficulties.

UTERINE AND ECTOPIC.

The combination also of uterine and ectopic gestation would present too many novel features, being so rare, and each case *sui generis,* to be more than mentioned as a possibility.

CHAPTER IX.

PHYSIOLOGICAL PUERPERIUM—MATERNAL.

NORMAL PUERPERIUM.

LABOR is a physiological process, but it is close to and partakes of the pathological, and at any moment may become so. The uterine veins are thrombosed, which anywhere else and under any other circumstances would be very dangerous. Nowhere else are the septic and aseptic so close. Cleanliness and rest are the two factors to aim for. Nature is better than art, and no injections are required or a bichloride gland would be part of her anatomy. The vulva should be washed or douched from above downward and kept carefully padded. Hot alcohol and water help soreness. These pads should be sterile cotton or gauze, not a deodorizing or aseptic gauze. You want to know if there is odor. For three days all friends should be excluded; only her immediate family and nurse should see her. The doctor should call twice daily at first, and as nearly as possible to the minute, for they often worry if he is late.

Her pulse is slower for a week than normal. The breathing remains thoracic in type and about sixteen to the minute. There will be some thirst and a temperature a little raised—one-half degree—but it should be normal the next day. The abdomen feels empty and the vulva sore. A chill is often present just after labor, from the sweating, weakness, and relaxation after the pain. It is never dangerous, but calls for covers and a hot-water bag to the feet. The desire for food is lost, but a little gruel or beef-tea is often well taken. The bowel is empty and from loss of pressure almost paralyzed —at least peristalsis is lowered, and this demands enemas or oil by the second day.

Her nervous system is excitable, especially as regards the baby. If it cries, up will go her temperature and pulse. If it cannot be kept away from her out of hearing, it is better to have it with her. This nervousness may take the form of sleeplessness and require a small dose of bromides or sulfonal. Chloral is not good here, as the heart is weak. On your visits you have much to note. Mark down pulse, respiration and temperature, condition of womb, lochia and genitals, bladder, bowels, nipples, breast, diet, appearance, after-pains,

nervousness, and visitors. You are to note also the baby's nursing, bowels, urine, cord, sleep, head, eyes, color, and appearance. All this should be done in an orderly and systematic manner.

For the first twelve hours the woman's head should be low; after that, the more she rolls, the better. Put on the binder yourself. Massage and alcohol rubs are of great help to her comfort.

The articulations may be movable and tender for some time and require rest in bed. If the recti are separated a bandage should be worn. A condition of hæmorrhoids may be very painful. Heat and mild astringents, as hot witch-hazel cloths, help greatly.

DISEASES DURING PUERPERIUM.

The local condition after labor is always one of the great stretching and considerable traumatism. The labiæ are œdematous and gaping. The fourchette is always torn in primiparæ, and possibly the perineum. The vagina is smoothed out and its rugæ lost, never fully to return, the vagina remaining shorter and wider than before and the vulva orifice permanently longer. This is due to submucous laceration of tissue. There are abrasions in the vagina which, with the fourchette, are healed by epithelial regeneration. The cervix is torn at the edges and widely dilated, closing to a finger's size at the tenth day. Five or six weeks are needed for it to reduce to normal size. The lochia is at first red, becoming serous and then white. Its composition is blood, mucus, epithelial cells and leucocytes, decidua, and germs. For about three days it is sterile, which usually gives time for abrasions to heal over. During the first four days it equals about two and one-fifth pounds; the fifth and sixth days, about nine ounces; sixth to ninth days, about seven ounces. The pads should be changed as often as soiled, usually every four hours for the first three days, and every six hours thereafter until the flow ceases. The lochia has a peculiar odor, which should be noted; if putrid, it is a sign of sapræmia; if a peculiar mawkish or no odor, you may suspect sepsis. According to its looks it is termed lochia rubra, flava, or alba. Especially bad is it if suppressed. Lochia stains deepest at center of pads and shades outward; if abnormal, it is the reverse.

Involution of the womb begins at once and lasts six weeks on an average. Immediately after birth its size is that of a womb of the twentieth week. A continuation of Braxton-Hicks contractions goes on, beginning a few hours after delivery. They are the cause of involution by compressing and squeezing out the lymphatics, particu-

larly. They are often painful and are the "after-pains" so-called. Especially do they start up when nursing, by reflex from the nipple. The hypertrophied muscle-cells undergo a fatty change and are absorbed. Many of the vessels are lost by compression and their walls absorbed, while others undergo the fat-change which is characteristic. The cavity is relined by epithelium from the decidua. There has been much dispute as to the exact change in the muscle-cell. Helme considered it a process of peptonization, and peptones have been noted in the postpartum urine. Others, particularly Meola (1884), considered it a granular atrophy rather than a fatty change; even hyaline fibers have been seen. It is probable that all forms exist, fat being the principal change. Certain it is that the fiber is not destroyed; it simply changes by increased oxygenation, relative anæmia, and pressure from the retraction and contraction. The change is at first slow and then quite rapid. According to Sänger, the length of a fiber normally is 24 millimeters; in the pregnant womb, 208.7 millimeters. A few hours postpartum it is 158.3 millimeters; fourth day 117.4 millimeters; second week, 82.7 millimeters; third week, 32.7 millimeters; fifth week, 24.4 millimeters, and the breadth is in proportion. The following table shows the normal change:—

	Weight.	*Height above Symphysis.*
End of labor		$5\frac{3}{10}$ inches (15 cm.)
First day	26 to 35 ounces	$5\frac{7}{10}$ " (14 cm.)
Second day	" "	$4\frac{6}{10}$ " (12 cm.)
Third day	" "	$4\frac{4}{10}$ " (11 cm.)
Fourth day	" "	$3\frac{3}{4}$ " (10 cm.)
Fifth day	" "	$3\frac{1}{2}$ " (9 cm.)
Sixth day	" "	$3\frac{1}{4}$ " (8 cm.)
Seventh day	18 to 20 ounces	3 " (7 cm.)
Eighth day	15 to 17 "	$2\frac{1}{2}$ " (7 cm.)
Ninth day	" "	$2\frac{1}{3}$ " (6 cm.)
Tenth day	" "	$2\frac{1}{4}$ " (6 cm.)
Fourteenth day	13 "	in pelvis.
Sixth week	2 to $2\frac{1}{2}$ "	

The placental site is the last to recover its normal condition, and four to six weeks after labor will show a patch of thickening. At first its sini are closed by clots, which must be absorbed. The ligaments contract as the womb shrinks, the tube convolutes, and the vessels become tortuous. The bladder may be bruised and the urethra œdematous. This and the relief of pressure and lack of muscular tone are apt to cause incontinence of urine, and possibly retention. A few days will correct this without treatment.

How soon after labor the womb is again fitted for pregnancy depends upon many unknown factors. It has been known to begin one month postpartum, but three to four months is probably the earliest possible limit for most women. It is exceptional, indeed, to see a second child born under sixteen months, but eighteen is common.

The development of the breasts is a late change in pregnancy, only reaching activity after labor. The real milk secretion begins on the third day. The first secretion, the colostrum, is a cloudy emulsion of epithelium and milk mixed with fat. It coagulates on heating. It is laxative to the infant and is all the food that the child needs, since the circulation during labor, increased by the activity of the womb, has filled the baby at birth with all the food it can handle for a few days. The true milk comes with a rush and is usually over-abundant. Efforts at nursing erect the nipple, congest the gland, and promote its secretion.

Non-septic Fever.—Watch carefully every woman's temperature. If it goes above 100.5 it is to be considered a morbidity temperature that must be explained. If it lasts longer than a few hours, especially if the bowels are free, it is to be considered septic and early and prompt exploration and treatment must be begun.

Edgar has noted this fever in 18½ per cent. Of these, 64 per cent. was caused by constipation, 10 per cent. by reflex causes, 5 per cent. by complicating diseases, neurosis by ¼ of 1 per cent., sepsis by 13½ per cent., and unknown, probably sepsis, 7 per cent.

The great cause is constipation, which is especially dangerous because it usually occurs about the third or fourth day, when sepsis begins if it is going to. For this reason I again urge you to open the bowels on the second day by oil, and so eliminate that source of error. The woman's unstable nervous system makes her especially liable to the mild toxic fever from absorption of intestinal products.

Reflex causes of fever are rare, not usually from the genitalia, more often from the nipple. This term is too often a scapegoat for sepsis.

Of the diseases accompanied by fever, malaria is the worst. The chill and fever are not unlike septicæmia, but fortunately the blood will tell at once if a plasmodium is present.

CARE OF THE BREASTS.

For a month or six weeks before labor, especially in primiparæ, the breasts should be hardened by some astringent: glycerine, alum,

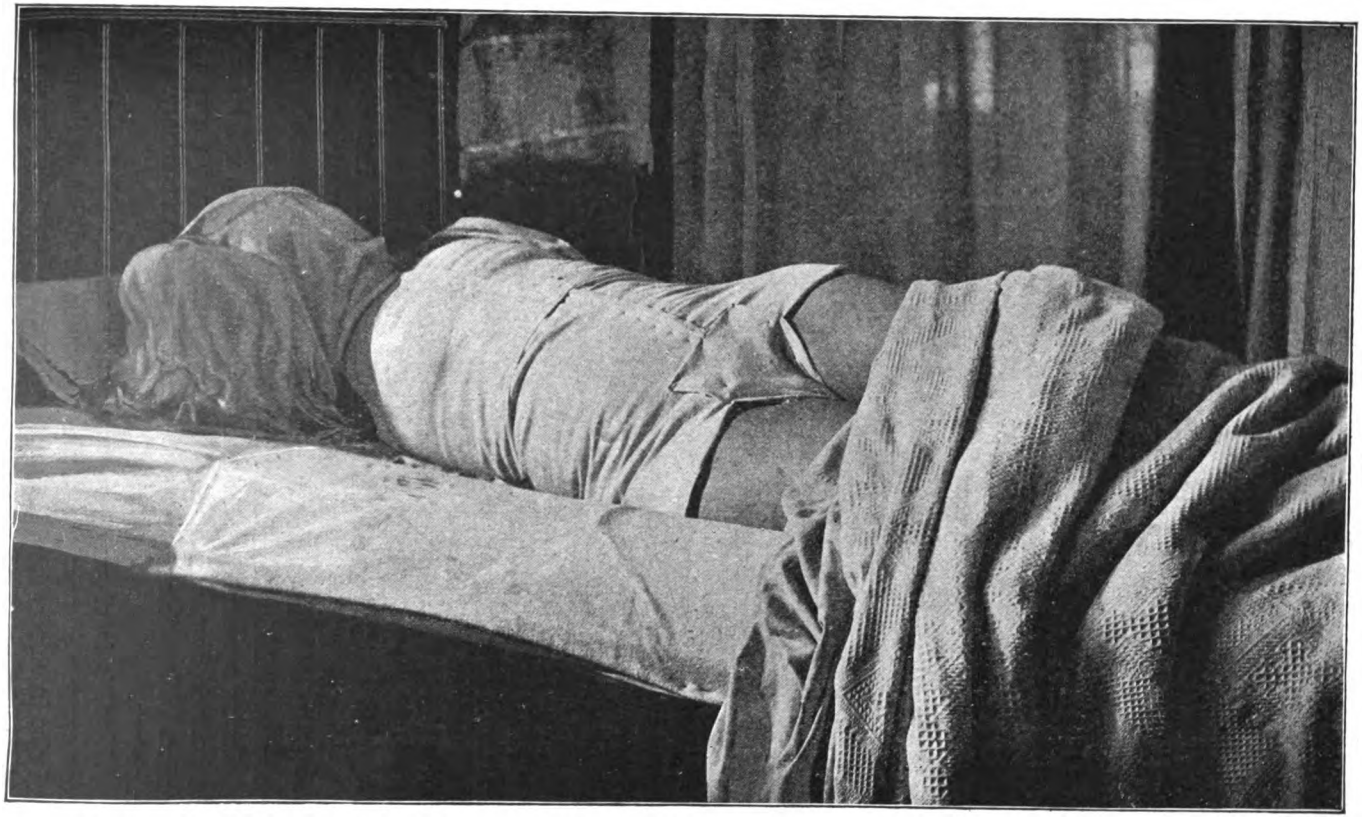


Fig. 53.—The Puerperal Breast and Abdominal Binder and the Vulvar Pad. (GRANDIN AND JARMAN.)

alcohol, etc. At the same time the nipples should be drawn out if retracted. This can be done by pulling or drawing out on the woman's part twice daily, or by a suction instrument, or a clay pipe may be used. When nursing begins they should be washed before and after, carefully dried, and dusted with talc or starch. A dry nipple will not crack. Nor should the baby nurse much oftener than a two-hour interval, or be allowed to nurse and sleep; but should nurse and be taken away. A nipple that is fissured should be touched with $AgNO_3$ and it will heal in twenty-four hours. At the first sign of trouble the breasts should be kept in sterile gauze, away from the air. Very tender nipples may force the use of a shield, but it is better not to use this when possible to do without it. The third day, when the secretion begins, is marked by congestion and engorgement with some tenderness and pain; fever is abnormal. The flow is more than the baby can take, nor will they adjust themselves for some days. In nearly every case it is necessary to draw the surplus with a pump after nursing. A snug binder at this time gives great relief, or a four-inch roller bandage may be put on. In the New York Maternity a rubber binder is used, which seems to act fairly well, but keeps the breast moist and a perfect culture-bed for a future mastitis. The bandage should be snug and kept on several days, especially when drying up the milk. Surplus milk can best be massaged out by oiling the hand and stroking towards the nipple. When this is no longer painful, support the breast and use firmer pressure with palm of hand and then by squeezing between both hands actually milk out the breast. Time and gentleness will milk out without much pain very congested and tender breasts. All lumps must be broken up and worked out. Once the milk has checked, nothing will bring it back; and nothing will cause so poor a flow, even if it does not absolutely check it, as a little fever when it is coming in, and the fever does not need to be high. For this reason it is my invariable rule to open the bowels the second day, as well as to recognize sepsis, should it come, by eliminating that source of error.

In cases where the breasts are painful, distended, and tender, if the pulse is slow, even if there is some fever, it is not a case of infection. When there is an infected breast, there is invariably a high pulse-rate.

Mastitis is of very frequent occurrence in mild forms. It is more common in primiparæ from the unused condition of the nipple, and also in blondes from the greater thinness of skin. There are four periods of nursing when it occurs:—

1. Beginning of nursing.
2. At sudden stoppage.
3. At dentition, from bites.
4. At weaning time.

In other words, the cause is traumatism, and these four periods are those of the greatest liability.

Mastitis exists in three varieties, according to the tissue involved:—

1. The most frequent cause is parenchymatous or glandular.
2. Subcutaneous.
3. And rarest—the postmammary, between the gland and chest-wall.

Now, absolutely understand, that its cause is not milk stasis, except as the congestion and venous stasis favor bacterial invasion. Engorgement of milk will not turn into abscesses, but a cracked nipple or source of infection may. It is in most cases due to the staphylococcus albus and aureus, and their entrance is through eroded or fissured nipples and taken up by the lymphatics. In a very small percentage of cases they may enter the milk-duct directly. The lower half of the breast, where the lymphatics are few, being occasionally involved, show this. Orth has suggested that the streptococci enter fissures and the staphylococci the ducts directly, which is in keeping with the tendency of both germs elsewhere. One thing is certain: there is never auto-infection.

In any case the milk is altered and fermented. The epithelium is swollen and inflamed, foci of pus form and collect into abscesses, slowly or rapidly. The first symptoms are pain and tenderness, a hard lump of milk in the inflammatory tissue, chill, and temperature. All this could have been prevented by toughening the nipples, keeping them clean, and touching fissures with silver nitrate and milking out the breasts.

The treatment is rest. Nursing must be stopped and the milk pumped out. The two forms, parenchymatous and interstitial, must be kept clearly in mind. In parenchymatous, massage, pressure, and ice kept on for days or until the pain stops, may abort the formation of an abscess. This is nearly impossible in the interstitial, which is certain to form pus. The breasts should be supported, and massaged as little as possible in the interstitial. In both types salines are to be given, fluids stopped, all fissures treated, and every effort made to check milk secretion.

When an abscess is formed, it is to be treated as pus anywhere

else and promptly evacuated. Fluctuation is rarely felt, but chills and fever, and œdema especially, indicate pus, which is more commonly found in foci than in one cavity. Don't fail, in operating, to open freely, that all pockets may be exposed, peroxide thoroughly, and drain with gauze. The opening should be low down, in a fold of skin, and radiate from the nipple. Abscess of the breasts rarely endangers life, but is most distressing and painful. It is one of the most intractable of complications, usually lasting as long as the milk is secreted. A cut duct may ooze pus and milk for months, but an effort should be made to close these by curette and cautery. A sinus cut off may leave a lump of hard secretion or form a secondary abscess, and in future lactation may give rise to great pain and much trouble. That family's practice is usually lost, and justly so, for by due precaution the condition could have been avoided.

CHAPTER X.

PHYSIOLOGICAL PUERPERIUM—FŒTAL.

THE BABY AND ITS CARE.

WHEN the baby is born it normally begins to cry in a few seconds. This cry is not due to lack of circulation, for the cord is beating steadily and will for some minutes. There are several theories for the child's breathing:—

1. The expansion of the chest, due to passing from compression to a medium of air-pressure.

2. Edgar suggests that the contraction of the womb cuts off the blood supply and the child needs oxygen. But it is not uncommon to see a baby cyanotic from cord compression turn red with the cord beating before any efforts to breathe are made.

3. The relief of pressure on the basal centers and flow of blood to them acting as a stimulant.

4. While these three theories have their upholders, the real reason is probably the shock of the cold air at birth, roughly a change from one hundred degrees to seventy degrees. The relief of compression fills the lungs, and the involuntary contraction due to the cold expresses it. Cold is a good mode of exciting respiration in the asphyxiated.

Respiration is largely by the skin for the first few days. The centers do not act perfectly automatically, and the crying is due to distress for air, which is a roundabout way of accomplishing what the poorly trained respiration center learns to do later. Babies at birth breathe from forty to forty-five times a minute, using the diaphragm, the abdominal type. Not all the lung is used, large atelectic patches persisting for months. Crepitant râles can be heard all over the chest for months. If the lungs were ever expanded, they will float on water; otherwise they sink, which is of medico-legal interest. The temperature at birth is from $99^1/_2$ to 100 degrees, elevated by the tissue changes. The baby has but little heat-producing power and must be kept warm by hot bottles and fires. Many, if not all, colics are the result of lowered temperature.

The ligation of the cord produces great changes in the circulation. The omphalic vessels are now useless and filled with a throm-

bus which is slowly absorbed and replaced by a band of fibrous tissue. The first inspiration sucks up the blood into the thorax and through the pulmonary arteries to the aërating system of capillaries in the lungs. The blood passes to the right ventricle and the Eustachian valve closes the foramen ovale, which agglutinates and grows fast. It is important to assist this by placing the baby on its right side for the first few extrauterine hours. The ductus arteriosus also begins its closure at birth and the right ventricle takes up its work, the pressure ahead being removed, and the blood not passing into the aorta as uniformly as before. The blood is not so much aspirated into the lungs as forced in by the removal of the pressure ahead. The heart at birth is quite large relatively. Right and left sides are nearly equal in musculature, but from birth hypertrophy of the left side begins. The rate is from 140 to 150 per minute, about five beats faster in females, which is true at all other stages of life. In infants, as in adults, crying, exercise, and emotions increase the rapidity. The volume of blood is relatively less than in adults; one reason for this is tying the cord too soon and losing the blood left behind in the placenta. If ruptured by nature or only after it had ceased to pulsate, the relative volume would probably not vary much. The blood is lacking in fibrin and clot-forming products, while the red cells are irregular and not uniform in contour and size.

Nature sloughs the cord by a line of demarcation first noticed about twenty-four hours after birth. If not oiled, the cord dries up and is not offensive. For the same reason it should be ligated close to the child, to have as little moist, dead tissue as possible. The baby should not be put into a bath-tub until the cord separates, and it should be kept dry by dusting. About the fourth to sixth day it separates at the mark. At the third day the red navel and ash-white cord are in sharp contrast. The stump granulates, and should be entirely well from the tenth to twelfth day. The scar-tissue contracts, as do the remains of the vessels, drawing in and puckering the navel.

The kidneys begin active functionation at birth and urine is passed within a few hours, acid in reaction, of low specific gravity, loaded with urates, and often albuminous. The bowels move with, or a few hours later than, the urine. The first movements are green or black, of tarry consistency, and known as meconium. Colostrum is the natural cathartic for this. The meconium is composed of inspissated mucus, epithelium, bile, urea, vernix caseosa, etc., from swallowed amnia. The bowels should move three or four times daily.

With the onset of milk the color changes to chrome yellow, pasty consistency, and fæcal odor. Green stools always mean improper diet and are a warning that a change is needed. If casein also passes, it is still more urgent.

The breasts of the baby are very prominent, often swollen, and secrete for the first two weeks. The cause of this is unknown. It is a popular idea among old women nurses to pull or squeeze them, or "break the breasts." This is to be absolutely forbidden, as it is liable to result in abscess. The legs are bent and the feet turn in—equinovarus. The toes are straight and the large toe as prominent as the thumb. The grip is very strong and the ulnar deflexion at the elbow marked. The child's neck is very weak and must always be protected. Boys are phimosed, while girls have projection of the nymphæ. The head is often moulded out of all symmetry, and a succedaneum is present if the labor was difficult and long. The head should be absolutely left alone. The two fontanelles are soft and well marked; ossification means idiocy. The posterior fontanelle closes about the second month, the anterior at the eighteenth. Craniotabes later is a sign of rachitis.

The cord should not be stripped before tying, for the moisture is soon absorbed and there is an element of traumatism in rough handling. The room must be kept warm, and the crib also by a hot-water bottle. In bathing, the water should be quite warm and the room almost hot. One bath a day is enough, but the child must not be put into the tub until the cord has dropped; and for premature or weak children, one bath a day is too often. There is great danger in chilling the new-born. After the initial shock at birth, it should be kept at blood-heat. The postpartum chill of the mother is physiological, to get her to wrap up herself and baby. Cotton or cheese-cloth sponges are better for sponging than sea-sponges. The skin is sensitive and must not be rubbed, and for the same reason all other than pure, unscented soap must never be used. The essential oils of the perfumes often cause eczema. If the baby is comfortable it will not cry at bathing time. All skin approximations must be kept dry by dusting powders.

In dressing the baby, the cord is attended to first, with a square of plain gauze split up and folded over the cord and a narrow belly-band pinned sung. Then follow, in order, the diaper, shirt, pinning blanket, slip, socks, and shawl. As soon as possible put the baby to the breast; first moisten the breast with milk, so the baby will take it.

Immediate nursing is instinctive and of great help to the mother.

Mouth and breasts must be washed both before and after nursing. The baby must never nurse too long nor be allowed to nurse and sleep alternately. It should nurse regularly every two hours all it will eat. and no more; and nothing but mother's milk and water should ever go into the baby.

The baby's training begins at birth, and a week's irregularity in its habits means trouble for some one. It should not be held much or be rocked in a cradle. Stillness, quietness, and darkness are best for the baby. A well-trained baby is as regular as clockwork in its habits. At birth the baby sleeps all the time if not nursing or disturbed. At one month it will be awake three or four hours in the twenty-four. At six months it sleeps sixteen hours, and the first to the fourth year ten hours daily. Children should never be excited or fed just before bed time.

After the sixth week nursing should be two and a half hours apart; fourth month to end of nursing three or four hours, with no night nursing during the last half. The breasts should be nursed alternately, and the primipara taught how to hold her baby. The baby must not be indiscriminately kissed, especially by others than its immediate family. I have seen cases of dire disaster following this. It should be the invariable rule to drop argyrol in the eyes as a prophylaxis against ophthalmia, without which there is no safety. The baby should not be picked up because it cries, but should be trained to roll around in its crib and content itself. The ideal nursery is a sunny room on the south exposure, at a temperature of 70 degrees, with a hard floor, dustless furniture, and plenty of ventilation.

Male children should have the foreskin worked back daily and kept from adherence to the glans. This will often prevent circumcision later and many ills beforehand. In females the hood of the clitoris should be likewise treated. Phimosis may actually occlude the meatus, and the straining end in rupture.

Constipation in the mother will show in the child, while the reverse is not true. When the baby is constipated there are four causes, under one of which it will be found to come:—

1. Constipation in the mother.
2. Lack of fat in the food.
3. Lack of sugar.
4. Lack of water.

The coils and length of the infant intestine are relatively greater than in the adult. Poor peristalsis and rachitis are closely

associated conditions, and in every form of intestinal disease mucus will be found and is always pathological. As soon as the child is old enough it should be trained to daily evacuations on the chair.

The stools are rarely alkaline in the child, either in diarrhœa or in health. Greenish stools, acid, excoriating, accompanied with gas and eructation, usually indicate an excess of sugar. If there is too much fat, it will pass in lumps, causing a colorless and dry stool. In artificially-fed infants, starch is a common cause of diarrhœa, for it cannot be digested until the fourth month. Diarrhœa from whatever cause should be treated by the following four steps: Purgation, starvation, feeding, and lastly drugs.

Begin every case with castor-oil, and then starve out the bacteria by withholding food for twenty-four or forty-eight hours. The bacterial flora fall under two heads: those feeding on proteids and those feeding on carbohydrates. The first give rank and fœtid stools, the second sour. When these are improved, feed slowly on albumin water and a little milk or by rectum, and only after doing these give any drugs. Diarrhœa is always an error of diet and no medicine will help until these preliminary steps have been attended to.

During the hot summer months there are a few points that deserve to be remembered with especial care. As mentioned, the regular giving of water, frequent bathing, free circulation of air, protection of the body from chills by a flannel belly-band, and prompt attention to and evacuation of the bowels when trouble arises will carry almost every baby through its trying first year in safety.

A child of one month may be taken out of doors with benefit daily in good weather, such as prevails in California. After six weeks it should go out daily, rain or shine, if bundled up warmly. Children require and must have good air.

Some infants at six weeks enjoy cold baths and will kick and splash delightedly. In a few months you can adjust the temperature to the child. It must not be so cold that the baby dreads it, nor so cold that the baby does not readily react to the shock. Be in no hurry to dress, but, if the room is warm, give it an opportunity to kick. Children are too often tightly bound up in outgrown clothes, and they like to be naked.

They are best weaned at nine months, or even eight, preceded by some months of milk, gravy, and soft-egg eating.

They should never be allowed to sit at the table and eat everything. The eruption of teeth is a natural indication for the child's

fitness for other food. If molars are delayed, for example, the child is rarely fitted for a farinaceous diet.

The baby may have, or be born with, nearly every disease. Even malaria may be contracted and give symptoms in the second week.

ASPHYXIATION OF THE CHILD.

(*A*) Causes operating before birth are:—

1. Compression of skull.
2. Compression of cord.
3. Compression of chest, *i.e.*, heart.
4. Separation of placenta.
5. Tetanus of womb.
6. Impoverished maternal blood.
7. Maternal blood saturated with chloroform or other poison.

(*B*) After birth:—

1. Compressed brain.
2. Heart too weak to respond—premature or exhausted.
3. Poisoned brain and centers.
4. Mucus or blood in larynx or unreflexed membranes.
5. Congenital atresia of pulmonary artery or nonclosure of foramen ovale.

The body will be either cyanotic or anæmic, the old "blue and white" types. Cyanosis means no loss of muscular tone, but a CO_2 poisoning and need of oxygen. When such a child dies, it turns white and indicates uselessness of further effort. The anæmic type indicates a failure of circulation that is the limit of life. Babies born cyanotic have a very strong heart-beat, as shown by the cord in the effort to get air, and the center is working; while in the white the cord is pale and does not pulsate, in them the centers being inactive and the heart inaudible. Before birth the condition can be diagnosed by the fœtal heart, meconium in the discharge, and in breech cases by the intra-uterine cry. Such a labor must be terminated at once or a dead baby results.

Efforts to resuscitate should be kept up for a long time, until signs of death are evident.

RESUSCITATION OF THE CHILD.

The physician must know several methods and be ready to use them any time.

1. Catch feet in one hand and hold head down, with neck in

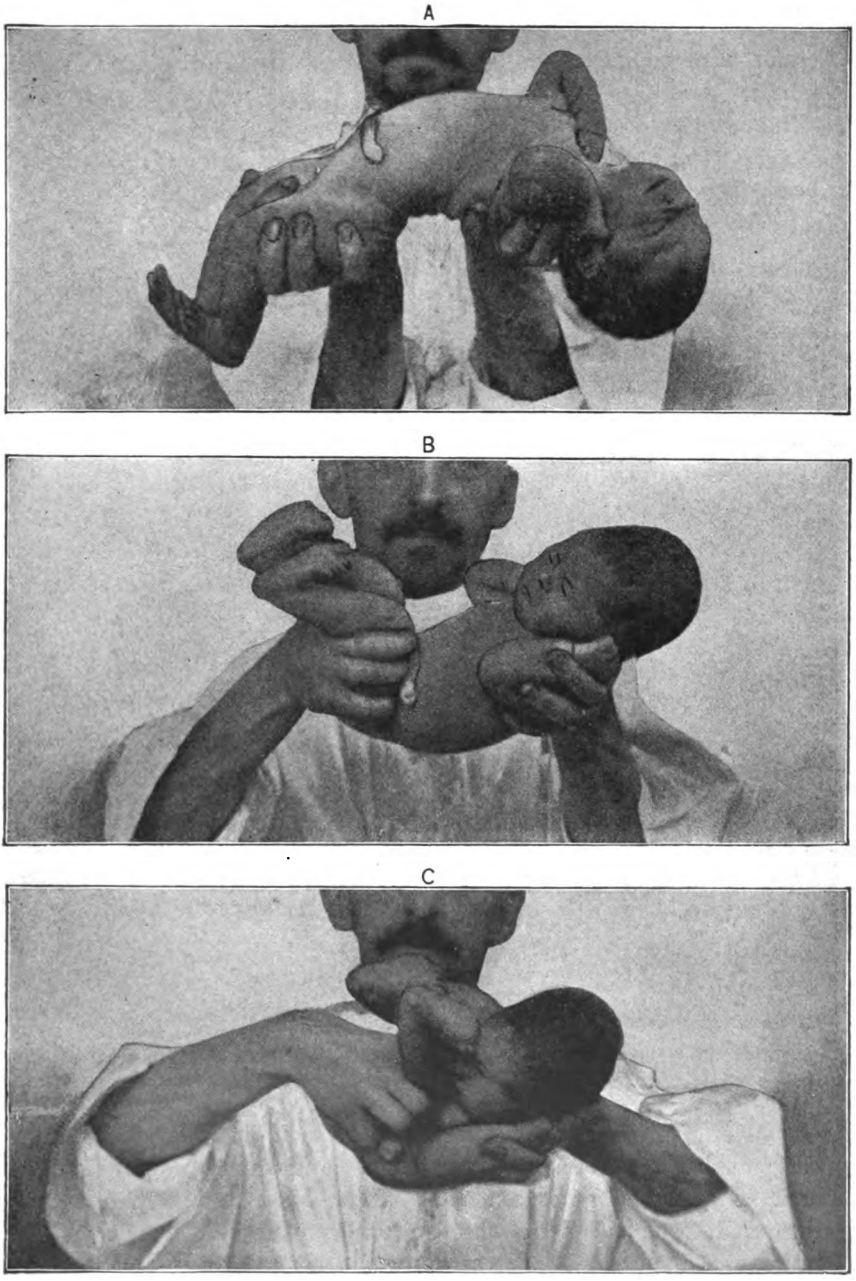


Fig. 54.—The Byrd-Dew Method of Artificial Respiration. *A*, Extension. *B*, Semi-flexion. *C*, Complete Flexion. (GRANDIN AND JARMAN.)

crotch of other hand, then jolt up and down fifteen to twenty times a minute.

2. Simply hold the baby head down.

3. Sylvester's method: place baby on back, extend arms over head, then bring down elbow and compress chest.

4. Irritation of larynx.

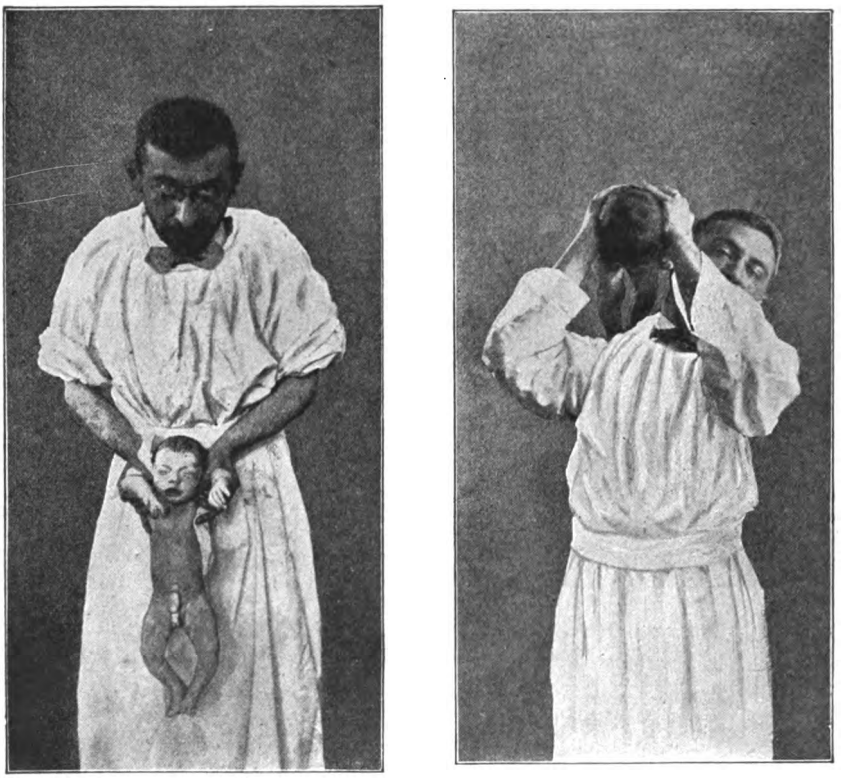


Fig. 55.—Schultze's Method of Artificial Respiration. (GRANDIN AND JARMAN.)

5. Munkevitch's method is to free the mouth and larynx. Place child on back, put thumbs over scapula and hands around thorax, back to operator, limbs extended. Now bend the body forward, separated legs, and back with uniform pressure of hands. This makes the diaphragm compress lungs and expand them, and is very like natural breathing. A small roll under back makes it more so.

6. Blowing in child's mouth, which is a very dangerous thing to do.

7. Byrd's method: bring ulnar side of hands together, palms up. Catch head in left crotch, the right hand over thighs, then bend child together and apart. The arms of the operator are raised and lowered, sweeping child through the air. This may be done while holding child in a bath.

8. Stimulation of hot or cold plunges, slapping buttocks, rubbing of the back, or dilating anus.

9. Shultz method: child on back, head to operator, the hands are flexed under back, first finger in axella and thumbs over clavicles; hang child, feet down, in front of body, swing child up as high as head and throw body over forwards towards operator, then swing child back to first position. This is very effective and also dangerous, but it will force air into a dead child.

10. Labarde makes rhythmic traction on tongue.

11. Sylvester's method may be modified by holding child by feet while the motions are being done, or by merely squeezing the chest.

12. Schücking has untied the cord, inserted a canula, and injected 30 cubic centimeters of normal fluid; others have allowed a little blood to escape with good results. In premature or feeble children, Byrd's method (7) and hot water is best.

In livid, cyanotic children, hot water, Byrd's, and Schultze's are best. In the anæmic and white babies, Sylvester's, Byrd's, and heat are best.

DEATH OF FŒTUS.

Syphilis is responsible for 85 per cent. of all deaths, while systemic slow poisoning from lead, autoinfection, tobacco, etc., accounts for the remainder. Placental degenerations *per se* are exceedingly rare. Unless the products of conception become infected, no change occurs in mother and the diagnosis rests on the ending of all sounds and movements, the breasts do not secrete, and the womb remains stationary in size. Should putrefaction occur, peptonurea comes on. The results, as regards the fœtus, depend on its remaining free from infection or otherwise. If infected, the womb expels it promptly and some septic absorption is the rule. If it remains asceptic, then it will

1. Macerate in the amnia, since the vernix is no longer secreted for the protection of the child, and it soaks to pieces.

2. It will mummify, and from absorption of water become leathery. This is the common end of one twin dead, which then becomes flattened into a disc, *i.e.,* fœtus papyraceous.

3. A change into adipocere, or it may be saponified from the deposits of the margarates of lime and potash.

4. It may be totally absorbed in a few weeks.

5. It may have a deposit of lime salts and become a lithopedion or stone child, and in this form be retained in the womb for years.

MONSTROSITIES.

These are of many kinds and interesting, but of little practical importance from their rarity. A few of the more common have a direct obstetrical bearing, polyhydramnios, often associated with major monstrosities of some nature, especially so.

1. In case of monstrosities, especially when unfitted to live, put the woman under chloroform and deliver her when unconscious. Cut the cord, but do not tie, and let it die. It is best not to tell the father until it is over, swear all present to secrecy, and get it out of the house before the woman can see it or call for it. Tell her it was born dead and had been so a long time. If a Catholic family, carefully baptize the child.

2. Hydrocephalus occurs about 1 in 3000 births. The head may be so large as to obstruct labor and must be tapped. Such a child will rarely live, and is idiotic, so that its life is of no value. Call it a dead child if you can.

3. A closed large fontanelle means a congenital microcephalic idiot and had better die at birth.

4. Umbilical hernia should be banded tightly as soon as possible. It may be slight, or the whole abdomen unclosed. The child is not apt to live.

5. Club-foot should be attended to within a few weeks after birth or as soon as the baby is strong enough. Impress this on the parents.

6. Imperforate anus is quite rare and may vary from skin closure to absence of colon. You need not examine every child born, but inquire next day as to urine and defecation. Crying and straining, with an unsoiled diaper the next day, should attract attention to this possibility. Operation must be done at once. It is not wise to elaborately dissect for the gut from below, but perform a simple celiostomy and note the distance the sound will reach down. If it is a slight closure, an anus may be made then or subsequently. An elaborate operation is too severe for the new-born child.

7. Failure of the maxillary plates to close will result in harelip or cleft palate. Nursing is difficult or impossible and the child must be fed by a spoon. Operation should be early. When possible to insert

pins and close lips by freshening edges, it should be done at once, as the baby has three days' rations in its body at birth and primary union is secured in that time. Cleft palate must be closed before the age of speech, if good articulation is ever to be gained.

8. Spina bifida may involve any part of the column, but is most common in the lumbar region. The tumor is of variable and varying size. Bind up and tell parents it will not live. Surgery has seldom cured, but it is the only procedure.

9. Extrophy of the bladder or absence of anterior wall is not fatal. Try to keep the baby dry. The surgical results are not good and may be deferred to any suitable age.

10. True hermaphroditism does not exist. The prayer of Salamis is a myth. In adult life it may be puzzling to tell the sex even by noting the escutcheon and general look. Absence of the bladder opening will require instant operation.

When a child is deformed to a point of never having a chance to reach average mentality, its life is valueless. It is the mentality and possibility of developing intelligence that make mere flesh human. Deformity of body is not an excuse for taking life, but that which precludes mind may be. I have no patience with those who consider such afflictions God-sent and to be borne with. Such belief is fatalism and not religion, and would be the death of all therapy.

PREMATURE CHILDREN.

These are born after viability at the seventh month and before the ninth. They are red, with little vernix, weak, with wrinkled skin, prominent belly, ears flat, scrotum empty, nails not out to the tips of the fingers, sleep nearly all the time, and under the eighth month have a pupillary membrane. It can neither suck nor swallow easily. Its chances of life are proportionate to its development. Very few under twenty-eight weeks will live, and few under two pounds in weight and thirteen inches in length. Tarnier gives the following table: At six months without an incubator none will live; with an incubator, 16 per cent.; at six and a half months, 21 per cent. without, 36 per cent. with; seven months, 39 per cent. without, 49 per cent. with; seven and a half months, 54 per cent. without, 77 per cent. with; eight months, 78 per cent. without, 89 per cent. with; eight and a half months, 88 per cent. without, 96 per cent. with. The Sloane Maternity Hospital reports are a little higher than this.

The lungs are not easily expanded and hernia is frequent. It must not be handled more than absolutely necessary, and must be kept warm and fed regularly with great care. The baby is unfitted

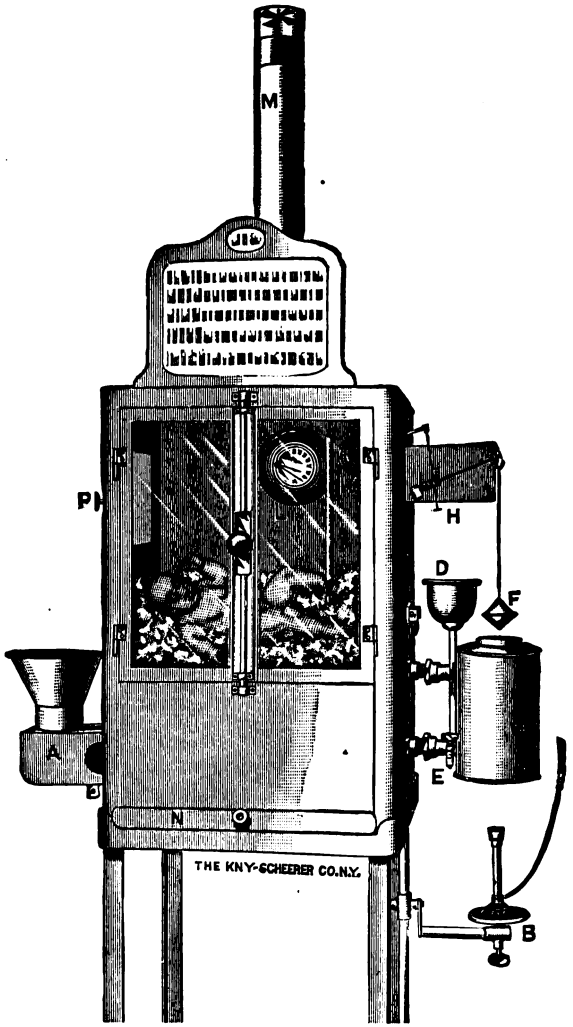


Fig. 56.—Incubator. (FISCHER.)

to live, being premature in every organ, but should be given a chance. At birth every drop of blood possible should be conserved from the placenta, and especial care taken to wrap the baby in hot towels, that

it be not chilled. As its surface area is relatively larger and there is no heat production, one chill may kill it. It must not be washed, but oiled and enveloped in cotton. Light must be excluded. Breast-milk fed to it with a dropper is essential. It will die on modified milk. It needs more food in reality than a child at term, and can digest less. At least two special nurses are needed, who should feed it one or two drachms of fresh breast-milk every hour and a half day and night. It must be fed slowly or it will strangle; and if unable to swallow, a No. 7 Fr. soft catheter should be passed into the stomach and the milk poured in.

In this connection it must be remembered that syphilitic children are to all intents premature. The circulatory system is unfitted for the change and the heart action is always weak. The lungs do not purify the blood, there is cyanosis, and some oxygen may have to be used. The digestive organs can take but little proteids, but can handle sugar. Breast-milk must be used exclusively. There are no sweat-glands acting in the skin until after birth, and the baby should not be washed, but should be oiled every three days. The absolute essentials are warmth and food. The first may be had by incubators, the last only by care. They do better when the inhaled air is colder than the body. The body should be kept from 95 to 90 degrees and the inspired air 85 to 80. The age and weight determine the prognosis. Brandy and strychnine will probably be required as stimulants. A drop in body temperature is a very bad sign.

The incubator was first devised by Denuce, of Bordeaux, in 1857, improved by Credè, in 1864, and perfected by Winchel, in 1880, by the addition of the water bath. The temperature should be kept at 90 to 95 degrees, and run down to 75 degrees before being permanently abandoned. The baby should remain in it a little longer than to full term. They are very hard to keep perfectly ventilated. Such incubators are also a fine thing for the germs present at the navel, which must be carefully watched for sepsis. The ideal incubator should combine ventilation of sterile moist air, uniform heat, quietness, ease of manipulation, accessibility to child, and practicability, which is impossible except with complicated machinery and in a hospital. One foreign hospital uses a whole room for this purpose. A temporary expedient may be devised by a telescope basket. The cover upside down is filled by a row of glass bottles (self-sealing beer bottles are good) and the inside is set down on them. The baby is wrapped in cotton, put in, and the whole covered over with a blanket. My own device combines every essential found in the womb,

but is very cumbersome and unsuitable for any but hospital use. Such children are feeble for years. They are apt to require oxygen for cyanotic spells.

INJURIES TO CHILD AT BIRTH.

Spontaneous injuries are always of less severity than instrumental. A rare injury at birth is traumatism resulting in meningeal hæmorrhage, apoplexy, or intercranial clot. Such a child is stillborn or with difficulty resuscitated, breathing feebly, crying weakly if at all, is cold, relaxed, and inert. It will usually die at once, and if it lives until reaction occurs convulsions will follow. The treatment is operative, as in adults. Many cases of idiocy, though very few of epilepsy, are due to injury at birth. Such injuries are the result of forceps or long-continued pressure of the deformed pelvis. Forceps well applied are harmless, but for the other condition there is no prevention.

Of the various marks on the head, those made by the forceps, depressions or cuts, are usually symmetrical on both sides of the head. Those made by the sacrum are usually around the parietal bone and run parallel with the coronal suture. It may run at an obtuse angle on the cheek, and thus mark a change in attitude. If there is a double promontory, there may be two parallel depressions. The depressions, spoon or gutter-shaped, on the parietal or frontal bones seldom cause damage and no attempt to elevate them should be made.

Monro Kerr has called attention to the fact that depression is only a harmless bend in the bone and that lateral pressure will replace it. On the other hand, fractures are inevitably followed by some cerebral pressure and brain injury.

The forceps tip in the stylo-mastoid region may cause facial nerve paralysis. This is the type of Bell's paralysis, where one-half of the face is paralyzed. They usually recover. The open eye and immobile half of the face make diagnosis easy. Erb describes a spot above the clavicle where the brachial plexus is easily injured by any pressure and is never recovered from. It may be injured by pulling on the shoulders or bending of the head. Küster does not think that it happens without some bone injury. The cranial bones are not infrequently bent by the forceps as well as grooved by the promontories. The parietal region can be bent like tissue paper without serious consequences. In transverse presentations the nasal bones may be fractured by the forceps.

Any of the long bones may be fractured or luxated. The humerus is ruptured only by direct force; 4 or 5 kilogrammes in a transverse direction is all that the bone can stand. The epiphysial ends give away before the joints dislocate, and may be overlooked. Dislocation at the joints is rather rare. The femur and tibia may be separated at the epiphysial junctions, particularly if the leg has been twisted, or the femur may break at the upper third in breech cases if the finger be hooked over it for traction. Birth paralyses are both cerebro-spinal and peripheral in origin. The first is caused by meningeal rather than brain hæmorrhage. Most still-births, especially in primiparæ, are the results of pressure upon the head and meningeal hæmorrhage. A peculiarity of birth paralysis is that it is bilateral, with motor signs and atrophy, while paralysis of later origin is unilateral. In fractures of the humerus at the epiphysis, the arm should be elevated to the height of the shoulder in a straight line with the neck, rotated outward and backward, and while in that position should be put up in plaster. Paralyses of the upper extremity are usually peripheral of the brachial plexus and the result of traction with the finger in the axilla. The arm is inwardly rotated, the head pronated, and the deltoid, internus spinatus, biceps, and brachialis anticus are paralyzed, as shown by the faradic current. In efforts to extract the head in breech cases the neck may even be dislocated or the clavicles fractured. A caput requires no treatment nor does a hæmatoma, which is a hæmorrhage between the bone and periosteum. A scalp wrinkle that can't be smoothed out as the head descends is a caput. If it is kept aseptic and bandaged it will be absorbed. A hæmatoma feels very much like a depressed fracture, for which it may be mistaken. Aspiration pneumonia generally means death to the patient.

In breech cases not only the neck may be dislocated, but injury to the muscles may result in a permanent wry neck. And I want to take occasion to again condemn the method of delivering the posterior shoulder by hooking the finger in the axilla.

Gonorrhœal ophthalmia appears about the third day, and results in 25 per cent. of the children becoming permanently blind. It must be at once treated by ice, bichloride douches, and scarification, and a specialist be called as a consultant if one is available. The new-born child is in no condition to resist infection, and ophthalmia comes suddenly and is very virulent. This must not be treated as vigorously as in the adult, for the baby's eyes will not stand irrigation to any extent. Gonorrhœa may be present and the mother show

no sign, and she may deny it even when aware of the fact, and it is found in every station in life.

It is the latent case that is dangerous. The germs are superficial and can be washed off at birth, but in a short time are under the membrane and it is too late. In every case the eyes of the newborn must be treated with some silver salt. Argyrol is equally effective and not so irritating as nitrate of silver, which, if used, must be washed off with boric acid solution and will leave some reaction in the eyes for days. But where this has been done, gonorrhœal ophthalmia has dropped from $7^1/_2$ to 0.5 per cent.

Gonorrhœal ophthalmia, even when treated, will leave one of four results:—

1. Total loss of the cornea and requiring enucleation.
2. Total loss of the cornea and total blindness from opacities.
3. Partial destruction of the cornea and local opacity.
4. The very best that can be hoped for is an irregular refractive surface or traumatic astigmatism and defective vision.

In 1901, Dr. Jardine, of Glasgow, noticed a peculiar keratitis in a difficult forceps case, the result of injury to the eye by the toe of the instrument. A few were noted from time to time, and in 1905 Ernest Thompson was able to report 9 cases. It is a rupture of the cornea in a vertical line usually. In a few hours the whole cornea is opaque. No vessels or tracts appear, and in time they always absorb and disappear, leaving behind a linear scar, which is persistent. Whether any degree of astigmatism will result is unsettled, but the presumption is that it will. Rare as is the injury, it is by no means an unlikely one if the forceps be poorly applied or the pelvis be badly deformed. It has a good prognosis as to sight.

Medication must be given to the baby directly. No medication of the mother will affect the child appreciably, popular ideas to the contrary, and they do not stand opiates well at all. Regurgitation of food and vomiting mean nothing. The baby overflows if too full, and without effort. Colic is generally from wrong nursing or more often cold. The chill prevents digestion and the milk ferments. This causes the trouble and is not due to any wind swallowed. Rub its belly with the warm, oiled hand, apply heat, and give an enema.

Hæmorrhage from the navel after the cord has dropped is an occasional accident in umbilical sepsis. As a last resort it can be checked by two pins inserted at right angles through the skin, and silk thread tied around them in a figure of eight.

Syphilis is common in some communities. History of a suspi-

cious eruption in either parent or repeated abortions is not to be overlooked. The baby may be marked at birth or erupt later, and the mother may show no sign of it. Such women are immune to their babies, but a wet nurse would contract it.

UMBILICAL HÆMORRHAGE.

Idiopathic hæmorrhage from syphilis may occur, or Buhl's disease, which is a hæmaphilia with constant oozing of blood, for which there is no cure. Adrenalin may be tried. The usual cause of hæmorrhage at the umbilicus is a slipping of the ligature from shrinkage of the cord within a few hours after birth. If the string is a broad tape it cannot be drawn too tight, and best of all is cotton, which holds better than silk. Later a gangrenous cord may bleed, since the arteries are then pervious. A few drops of blood from the granulating surface when the cord drops means nothing. Normally, even if not tied, but torn or crushed, there will be no hæmorrhage. The coagulability of the blood is less in sepsis, syphilis, and jaundice.

The cord and navel may be infected, especially if the mother is septic. The cord will ooze a bloody serum and the navel will be ulcerated and ulcerous. The toxins are absorbed and may be rapidly fatal. Cleanliness and aseptic dressings are all the treatment that can be done. Erysipelas, once quite common, is now happily infrequent. Tetanus may gain entrance by the navel and is soon fatal. The baby at birth begins a losing struggle against germ-invasion that ends on the day of its death. Both infancy and old age are particularly susceptible and but little resistant. Especially, then, keep this open and absorbable spot free from infection.

A rise of temperature of the baby may mean a lack of food or starvation fever, which would yield at once when given nourishment.

Atelectasis persists during the first year. Weak babies may not be getting air enough, and premature ones never do. The crying of the baby serves to increase the rapidity of its breathing and fills the lungs. If the child be too feeble to cry, it is sure to have a poor circulation, become cyanotic, and die. It is a good thing to hear the baby cry lustily a few times a day. The wonder is that under a change to an air medium from a water one, when heart, lungs, kidneys, digestion, and skin all begin action, that they don't all succumb.

Jaundice on the second day is quite common to a mild degree. The urine is high-colored and stools light. In the severe form it is exceedingly fatal. In this the liver is cirrhotic, the blood disin-

tegrated, and hæmorrhages occur throughout the body. In the mild type use calomel and the regular treatment.

Infants are often troubled with uric acid. They pass but little urine, which stains the diapers brown, with red granules at the edges. The baby cries and strains when passing water. The cause is the alteration of the blood and nitrogenous metabolism, with insufficient water to dissolve the salts. The treatment is to supply plenty of fluid.

The infant is never tubercular under three months of age. At about the time they begin to creep and put everything into their mouths to determine shape and form, this is the time the tubercular infection begins. The nursery should have floors that can be wiped up and kept germ-free.

CHAPTER XI.

NURSING.

MILK.

HUMAN milk is a white, opaque fluid, of sweetish taste, alkaline reaction, and specific gravity of 1030. It is an emulsion of fat in a milk plasma, and unless contaminated from without is sterile. The fat is a glycerine base combined with palmitic, oleic, stearic, myronic, and butyric acids, identical with the fat of the human body. The proteids are a casein peculiar to itself, serum albumin, and nuclein. The casein is not identical with that of other milk, particularly that of the cow, and is combined with calcium phosphate and is in solution. Any acid that will combine with the calcium phosphate will precipitate the casein. When milk sours it is because the bacillus acidi lactici has generated lactic acid, which has so combined with the casein. The peculiar ferment in rennet will also precipitate the casein. Milk also contains milk-sugar, salts, and a trace of diastase. Maro finds a sugar-converting enzyme in human milk not found in cows. Milk is a true secretion and contains every and all the elements the child needs in its early life. It is at its best about the eighth month, and then deteriorates. It changes somewhat, but within very slight limits, and it is the child that modifies the milk to its varying needs. At first about one pint daily is secreted, but at the eighth month it is about a quart.

Milk is best in a young and vigorous woman, but every woman can nurse her child unless from sepsis or some cause that is associated with fever the secretion is destroyed. There is no such thing as inability to nurse; it is more often that they simply won't. As a great rarity, of course, there are women who are not good milkers, and can only nurse their baby in part, and this must be conserved and can be helped a little by massage and diet. The quality is easier to improve than the amount. A high specific gravity means a low percentage of fat, and the reverse. On standing, the cream should be one-tenth of the height. It is not altered by sickness, menstruation, or emotion. There is no such thing as "sorrow milk." Drugs, especially those that are excreted by the skin, will be found in the milk. The fat constituent is the one easiest altered.

Polygalactia, or too much milk, is as equally rare as too little. This will soon adjust itself to what the baby can take, as a rule. Milk during fever does not hurt the child, but fever is the worst thing for the secretion. Sepsis or malaria will surely check or end it, and if it returns it is never what it should be in amount.

The breasts are modified skin-glands, and whatever increases the skin action or is excreted by the skin affects the milk. Fluids tend to increase the amount, but at an expense of its richness, while cathartics will decrease the amount. When women are unable to nurse their children, a wet-nurse is far preferable to artificial food, and is the rule on the continent. It has not been the custom in the United States because of habit and expense. The average woman is deluded by the false and misleading statements of the various food manufacturers.

A wet nurse should be from twenty to thirty years old, healthy and strong. The babies should be of about the same age. She should be neat and clean, of good habits and temper, with good skin and teeth, and free from disease, especially syphilis. Her breasts should be conical, with good nipples and plenty of glandular structure, with only moderate fat. Her milk should be 1030 specific gravity, and 3 to 4 per cent. cream. Women who offer themselves are, as a rule, objectionable; really good ones are hard to get and are very independent. Edgar has declared them one part cow and nine parts devil, in which opinion sad experience leads me to concur. The best galactagogues are general tonics, food, milk, and hygiene. Cornmeal gruel is especially good. Thyroid extract, 1 grain *t.i.d.*, increases both quantity and quality, but must be cautiously used.

When it is necessary for any reason to dry up the milk, the breasts should be tightly bound, ung. belladonnæ applied to them until dryness of the throat results and catharsis (saline) should be induced. Milk out cakes.

ARTIFICIAL FEEDING.

This is seldom needed, but is becoming more and more common in the United States. I know of no more difficult subject to make clear, nor one requiring greater skill in application. Even those of the greatest experience can give no fixed rules, and every case will require separate methods of feeding. I can only outline a subject which will bring many anxious hours in practice.

The baby at birth is still premature. Gestation is not ended when the third stage is over. The child lived nine months intra-

uterine while its parts are forming, deriving nourishment through the chorion from the mother's blood—a uniform product. It then becomes extrauterine and derives its food from a uniform fluid, the milk, mammary nourishment, for nine months more, while its organs are developing. After that it is a small adult, capable of digesting the same food and requiring care only, which any one can give it, to reach maturity. The baby needs its mother's nourishment just as much for nine months after as before birth. In all nursing animals profound changes take place in the digestive tract during this period of development.

Mammary nourishment entirely, now lingering in the marsupials, was once the universal method. Now it is but secondary. The blood of one species can form the embryo of its own species only, and so, too, the milk of one species can only normally develop the young of its own species to maturity. Human milk alone will raise a normal baby. When this cannot be had, then the nearest to it must still be milk, and we fall back on cow's milk as the only available supply. Prepared foods are modified milks, perhaps suitable for one baby in a thousand, but all are objectionable and untrustworthy. A modification of the milk intelligently done by you for individual needs will succeed better. And this cow's milk must be modified. To the average woman, milk is milk, and you need to impress upon her that her baby will starve upon raw, unmodified cow's milk.

Again, by modification you can no more make human milk out of cow's milk than you can manufacture an egg. Living chemistry still refuses to follow test-tube rules; fat is not fat, nor proteid, proteid. At birth the baby has no stomach function whatever. For three days no milk is secreted, only colostrum, which is largely fat and passes directly into the intestine to be partly absorbed, but the bulk of it acts as a cathartic. About the third day the rennet action of the stomach begins, very feeble, at first, but increasing with use. With the advent of rennet the first step of digestion occurs. The casein of the milk is in combination with the lime. The rennet alters this to a lime and paracasein in soft, flocculent masses, which easily pass into the intestine. The stomach is of little capacity, about one ounce, and requires a fluid, fed often.

The next step is for the glands of the stomach to secrete acid and pepsin in feeble amounts. These two, acid and pepsin, are correlated. A different digestion comes with this. The casein and lime are acted upon by the acid, which combines with the lime and a free casein is set loose that the pepsin must digest. This is a harder and more solid

curd. Every bit of the acid has its pepsin equivalent. A longer time, as well as a stomach larger and better muscled, is required for this. The nursings must therefore be farther apart. With the use of the muscles and increase of the acid and pepsin secreting power, the rennet digestion becomes less and less prominent. Excess of acid combines with the lime paracasein as a chloride paracasein, also acted upon by pepsin, which is practically adult digestion. The milk does not change, but the action in the stomach does.

We have, then, three distinct substances: lime paracasein, free paracasein, and chloride paracasein from one uniform food, but digested in entirely different manners. Milk alone is adapted to develop the muscles and secreting function of the stomach, and the solid form is constantly more difficult of digestion until weaning, when the result is a stomach suitable to the peculiar food of its kind. The casein of every animal differs and is peculiar to its species and the future food it is to digest. When the gastric digestion is stronger, the curd is more solid and it remains longer in the stomach. If it is weak, it remains more fluid and passes sooner into the gut, and feedings must be more frequent. Normally they mutually and automatically adjust themselves. If digestion remained of the rennet type, then the stomach would never develop, or if predigestion were always done the same would hold true.

Cow's milk has a heavy percentage of casein to rapidly fit its young with a large stomach suitable for grass consumption. Twenty pounds of hay equals one pound of proteid. Ruminants also rechew their food and a large receptacle is required, and in them we find digestion acting best when the stomach is full. Non-ruminants, like the horse, have small stomachs and food rapidly passes into the gut, which must be of large cœcal area for absorption. The hard curd of the cow and its high percentage of casein are to fit the calf with a relatively large stomach as soon as possible, while the very reverse is true in man. This casein, then, must be brought down to the human standard first of all, and then is admittedly not the same as the baby needs. Nor is the fat of cow's milk the same as human, which is in finer emulsion and more easily absorbed.

There is a close ratio between the proteids of the various milks and the rapidity of growth of the young, as the following shows:—

Cat,	9.3	per	cent.	of	casein—its	young	double	weight	in	5 days.
Dog,	8.28	"	"	"	"	"	"	"	8	"
Lamb,	7.	"	"	"	"	"	"	"	47	"
Cow,	4.	"	"	"	"	"	"	"	47	"
Man,	1.5	"	"	"	"	"	"	"	182	"

The milk of the dog is very rich in proteid, but the stomach required by the adult is small. Four pounds of lean meat equals one pound of proteid, but the gain in growth is very rapid, and gain in growth is equivalent to digestive ability. The lower the percentage of proteids, then, the slower the digestive development and the slower the growth.

To duplicate human milk we must aim to get a substance the constituents of which are as identical as may be to human milk, or at least of animal origin. It must contain nothing not found in human milk, and the whole must not be changed by chemistry or temperature. This drives us to modification of milk itself. Milk contains proteid, water, and minerals classed as tissue-builders, and fat and carbohydrates for energy-producers. Notice the following table of Southworth's:—

	Tissue-builders		Energy-foods	
	Proteids	Minerals	Fat	Carbohydrates
Human milk	1½ to 1¾%	0.20 to 0.25%	3 to 5%	6 to 7%
Cows' milk	3 to 4%	0.70 to 0.80%	3 to 5%	4 to 5%

and it will be seen that while the energy foods do not differ greatly, the tissue-builders do, and here we have to modify cow's milk. The following table is also Southworth's:—

	Tissue-builders		Energy-foods	
	Proteids	Mineral	Fat	Carbohydrates
Human milk	1½ to 1¾%	0.20 to 0.25%	3 to 5%	6 to 7%
Cows', ½ diluted	0.75 to 1%	0.18 to 0.20%	0.75 to 1.25%	1 to 1.25%
Cows', ⅓ diluted	1 to 1⅓%	0.23 to 0.27%	1 to 1.70%	1⅓ to 1.70%
Cows', ½ diluted	1.5 to 2%	0.35 to 0.40%	1.5 to 2.5%	2 to 2.5%

Now, if the cow's milk one-third diluted have the cream and sugar of an equal bulk added, the result would be this:—

	Tissue-Foods		Energy foods	
	Proteids	Mineral	Fat	Carbohydrates
Cows' milk, ⅓ diluted	1 to 1.33%	23 to 27%	1 to 1.70%	1⅓ to 1.70%
Cream of equal bulk	.....	.....	2 to 2.30%	4 to 5.30%
	1 to 1.33%	23 to 27%	3 to 4%	5½ to 7%
Human milk	1½ to 1¾%	20 to 25%	3 to 5%	6 to 7%

which is a very close approximation, with the proteids a little under. This is no objection, because the proteid of the cow is a more solid curd and harder to digest. It is the proteid of the cow that the infant stomach finds most difficult to handle. If it is too low the child may pile on fat, which disguises its feeble muscles and, though fat and apparently healthy, it may really be weak-muscled and rachitic-boned.

A quick rule would be to set in a pan night's milk sufficient for the child. In the morning skim the cream from this into a vessel. Take fresh morning's milk one-third of this amount, and by adding water bring it to equal volume. To this add all the cream taken from the milk of the night before. This is one-third diluted milk with the total cream of the same amount.

A rule that I have followed for years is close to this. Set milk to rise, skim, replace one-half of the skimmed milk with an equal bulk of water, add all the removed cream and the white of one egg, and sweeten. This egg-albumin is foreign to milk and yet is borne well by the stomach. Human milk has its proteids in the form of albumin and casein. Albumin and casein are:—

	Human Milk	Cows' Milk
Albumin	1.23 per cent.	0.53 per cent.
Casein	0.59 per cent.	2.88 per cent.

reversed in the cow, casein being in excess. If the casein of the cow is sufficiently diluted, egg-albumin added seems to bring it closer to human milk. The size of the infant stomach increases very slowly during the first two months, and for two more it is stationary. At birth it will hold one ounce, at one month two and a half ounces, at two months three and a half ounces. At the end of the second month the acid and pepsin glands begin to functionate and it is for the first time able to handle casein and some cow's milk. The mortality of the artificially-fed follows this closely: 75 per cent. of deaths under one year occur in the first six months; the highest mortality is in the first week, drops rapidly to the second month, and then is stationary; the third month is but a fraction of the first. If, then, the child can be nursed the first two months, it has a greatly added chance of life. In fact, infant mortality is practically a question of its digestion. The greatest gain in weight is during the second month, equalling one ounce per day. Fifty-one per cent. of bottle babies die

in the first year, as against 8 per cent. breast-fed. Ninety-seven per cent. die of gastro-intestinal diseases, and the great cause of this is improper food. Now, raised cream is fat surrounded by proteid, which prevents union into an oil. Centrifuging breaks it away and alters the cream. Such cream passes as an oil through the gut and is but partially digested and absorbed. It is unfit for use. The cream used must raise naturally, and sixteen hours are required for this. As one writer says, "What God hath put together, let not the pseudo-scientist put asunder."

The following classification of Pisek covers all the methods of modifying milk:—

1. Methods that affect only the quantitative composition of the milk:—
   - (*a*) Dilution with water.
   - (*b*) Dilution with water and fat and sugar.
   - (*c*) Removal of part of casein (whey and cream mixtures).

2. Methods that prevent or alter the formation of curds in the stomach by inhibiting rennet action:—
   - (*a*) Milk and lime-water.
   - (*b*) Carbonate of potash.
   - (*c*) Borax.

3. Methods that prevent or alter curding by rennet inhibition, as in No. 2, plus neutralization of acid in the stomach:—
   - (*a*) Soda bicarbonate, 1 drachm to 1 ounce of milk.
   - (*b*) Syrup of lime, 1 drachm to 1 ounce of milk.
   - (*c*) Mag. hydrate, 1 drachm to 1 ounce of milk.

4. Methods in which acids precipitate casein and prevent the formation of rennet:—
   - (*a*) Buttermilk feeding.
   - (*b*) Kumyss.
   - (*c*) Matzoon.
   - (*d*) Dilute HCl.

5. Methods that profoundly alter the character of the milk:—
   - (*a*) Peptonizing.
   - (*b*) Ammon. citrate, 1 drachm to 1 ounce of milk.
   - (*c*) Potash citrate, 1 drachm to 1 ounce of milk.
   - (*d*) Sodium citrate, 1 drachm to 1 ounce of milk.
   - (*e*) Oxalate of ammonia, $^1/_2$ gr. to 1 ounce of milk.
   - (*f*) Oxalate of potash, $^1/_2$ gr. to 1 ounce of milk.
   - (*g*) Oxalate of soda, $^1/_2$ gr. to 1 ounce of milk.

6. Methods that indirectly alter milk:—

(*a*) Scalding or boiling.
(*b*) Pasteurization.
(*c*) Sterilization.
(*d*) Condensed milk.
(*e*) Evaporated cream.

7. Methods that mechanically alter the curds without affecting digestive action:—

(*a*) Dilution with gruel.
(*b*) Dilution with dextrinized gruel.

1. Dilution with water we have shown not to be sufficient, but dilution plus sugar and cream is the best we can do. Pure whey feeding gives the stomach nothing to do; some casein is essential.

2 and 3. This springs from the idea that cow and human milk differ in acidity, and is wrong. They do not. The lime-water or other alkali neutralizes the acid of the stomach, and so inhibits any pepsin digestion and early prevents the rennet from its action. Alkaline milk absolutely prevents any stomach action and simply passes it on to the intestine in a fluid condition. When 40 grains of soda will neutralize 20 ounces of adult gastric juice, how much it neutralizes in the feeble infant's can only be guessed at.

4. Such milk is unsuitable for infants under the acid-secreting age. These acids combine with the lime of the lime-casein of the milk. The free casein then combines with the excess acid into an insoluble acid casein that rennet will not touch. Adults can easily handle it, and so can infants ready for acid pepsin digestion.

5. No rennet curd can form in the presence of these products. The baby is merely filled with something other than milk.

6. Heat alters casein, rendering it very insoluble. No rennet can alter it, and the lactic-acid-forming germs are killed, so that the acid for the pepsin to act with must come from the stomach. Germ life is actually an aider to digestion. These are efforts to preserve milk that ought to be thrown away.

7. These mechanically prevent the formation of the hard casein curds by separation, but do not favor their digestion. They are thrown into the gut, to be excreted as foreign substance. The proteid of the gruel used is digested in place of the lost casein in many cases, but the curds are left to irritate the intestine and sour on their way. The stomach cannot develop, as the milk remains fluid and quickly goes on into the intestine. Alkalies then retard or destroy

rennet digestion in the young infant and prevent pepsin digestion in those older.

The ingredients of milk suitable for the baby should be:—

	Fat	Sugar	Proteid
First week	2 per cent.	5 per cent.	0.50 per cent.
Second week	3 "	6 "	0.75 "
First month	4 "	7 "	1 "
Second month	4 "	7 "	1.50 "
Fourth month	4 "	7 "	2 "
Sixth month	4 "	7 "	2.50 "
Eighth month	4 "	7 "	2.75 "

The analysis of cow's and human milk gives the following for average computation:—

	Human Milk	Cows' Milk
Water	87.16 per cent.	87.10 per cent.
Fat	4.28 "	4.20 "
Casein	1.04 "	3.25 "
Sugar	7.04 "	5.00 "
Salts	0.10 "	0.52 "

Engle gives the following:—

½ liter clean milk.

½ liter boiled water.

15 grams butter—equals level tablespoonful.

36 grams milk-sugar—equals two tablespoonfuls.

Bring to a boil and cool, and add one-half egg and stir constantly. This also is close to human milk in composition.

These receipts mentioned have been modifications of milk to a common standard as near to human milk as possible, put into concise and easily followed rules. There is another method used by many, of getting a modified milk from the various levels of cows' milk, standing until the cream gravitates to the top. They are very hard to explain and still harder for the mother, often an ignorant one, to follow. I do not like them, for it turns the house into a chemical laboratory and I have found it impossible to get so complicated a process followed with any accuracy. The simplest is that of Dr. Brown, of Elmira, N. Y.

The upper one-fourth of cows' milk has: fat, 10 per cent.; proteids, 4 per cent.; sugar, 4 per cent. Here the fat and proteids

are to each other as 1 to 2½, or the same as human milk. Pouring off the upper fourth of twenty ounces of milk running 10 per cent. cream, and diluting one-half or with an equal bulk, we have, with an even teaspoonful of sugar added, a milk with fat, 5 per cent.; albumin, 2 per cent.; sugar, 2 per cent.

Bauer (New York Medical Journal, March 20, 1898) has a very complicated formula for preparing milk. Winters has a table for preparing milk, as follows:—

FORMULA I, FOR FIRST, SECOND, AND THIRD DAYS.

Upper 1 ounce from quart of milk sixteen hours after milking.

Cream	1	ounce.	Fat, 2 per cent.
Milk-sugar	4/5	"	Milk-sugar, 7 per cent.
Lime-water	¾	"	Proteids, 0.25 per cent.
Boiling water	9	"	

Quantity of each feeding, one-half ounce. Ten feedings, at 6, 8, 10, and 12 A.M., 2, 4, 6, 8, and 12 P.M., and 4 A.M.

FORMULA II, FOR FOURTH, FIFTH, SIXTH, AND SEVENTH DAYS.

Upper 1 ounce from quart of milk sixteen hours old.

Cream	1½	ounces.	Fat, 2.5 per cent.
Milk-sugar	55/100	"	Milk-sugar, 7 per cent.
Lime-water	1	"	Proteids, 0.30 per cent.
Boiling water	11	"	

Feed one ounce at times as above.

FORMULA III, FOR SECOND WEEK.

Upper 4 ounces of a quart sixteen hours old.

Cream	2¾	ounces.	Fat, 3 per cent.
Milk-sugar	1⅓	"	Milk-sugar, 7 per cent.
Lime-water	1⅓	"	Proteids, 0.50 per cent.
Boiling water	15	"	

Feed one and one-half ounces at times as above.

FORMULA IV, FOR THIRD WEEK.

Upper 8 ounces of a quart of milk sixteen hours old.

Cream	4½	ounces.	Fat, 3.5 per cent.
Milk-sugar	1⅖	"	Milk-sugar, 7 per cent.
Lime-water	1½	"	Proteids, 0.75 per cent.
Boiling water	15	"	

Feed two ounces at times as above.

FORMULA V, FOR FOURTH, FIFTH, AND SIXTH WEEKS.

Upper 10 ounces of a quart of milk sixteen hours old.

Milk-sugar	1⅘ ounces.	Fat, 4 per cent.
Lime-water	2 "	Milk-sugar, 7 per cent.
Boiling water, up to quart.		Proteids, 1 per cent.

Feed one and a half ounces at times as above.

FORMULA VI, FOR SEVENTH, EIGHTH, AND NINTH WEEKS.

Upper 15 ounces of a quart of milk sixteen hours old.

Milk-sugar	1⅗ ounces.	Fat, 4 per cent.
Lime-water	2 "	Milk-sugar, 7 per cent.
Boiling water, up to quart.		Proteids, 1.5 per cent.

Feed three ounces at 6, 8.30, and 11 A.M., 1.30, 4, 6.30, 9, and 12 P.M.

FORMULA VII, FOR THIRD AND FOURTH MONTHS.

Upper 17½ ounces of quart of milk sixteen hours old.

Milk-sugar	1½ ounces.	Fat, 4 per cent.
Lime-water	2 "	Milk-sugar, 7 per cent.
Boiling water, to quart.		Proteids, 1.75 per cent.

Feed three to four ounces at 6, 9, and 12 A.M., 3, 6, 9, and 12 P.M.

FORMULA VIII, FOR FIFTH TO NINTH MONTH.

Upper 20 ounces of a quart of milk sixteen hours old.

Milk-sugar	1¼ ounces.	Fat, 4 per cent.
Lime-water	2 "	Milk-sugar, 6.5 per cent.
Boiling water, to quart.		Proteids, 2 per cent.

Feed five to six ounces at 6 and 9.30 A.M., 1, 4.30, 8, and 12 P.M.

Two more are given, but can be of no value, as child needs and can take general diet at nine months.

TOP-MILK PLAN OF MIXING.

	Fat.	Proteid.
Upper ½ ounce	24.8	3.1
" 1 "	23.1	3.2
" 2 ounces	21.4	3.3
" 4 "	20.1	3.4
" 6 "	18.6	3.5
" 8 "	16.7	3.6
" 12 "	12.1	3.7
" 16 "	9.4	3.8

Condensed milk is an average consistency of

Fat	7	per cent.
Proteids	8.5	"
Sugar	51	"
Salts	1.5	"
Water	31	"

and where the milk is poor or known to be contaminated, it is sometimes better to modify condensed milk.

There must not be too much theory in artificial feeding, and results must be watched. No matter what the child takes, if it gains in weight and strength it is doing well and should be let alone. The baby must be weighed every week. A baby weighing seven pounds at birth should weigh seven pounds at end of first week; seven pounds six ounces at second week; seven pounds fourteen ounces at third week; eight pounds six ounces at fourth week; or a gain of six ounces per week, say. Whenever there is a standstill for a week, it is time to begin a change. This gain in weight is to be watched in connection with the stools. If they are soft, yellow, homogeneous, and not too offensive, it is doing well. Diarrhœa is a sign of something wrong—either too much fat or too much at a feeding. If stools are green and offensive, it is getting too much milk and not digesting what it gets. If lumps of curds are passed, the baby is getting too much casein. If symptoms of rachitis, anæmia, tabes cranii, rosary, sweating, and fretfulness show, there is a lack of saline and bone food. Colic and diarrhœa of curds are a sure sign of casein that is undigested. Rancid, evil-smelling vomit and stools mean too much fat. Constant regurgitation is from too rapid or too much feeding. Flatulency, colic, vomiting, inanition, green, curdy diarrhœa, all are danger-signals of wrong diet.

There is a great danger of over-feeding the baby. It is starving for something, and eats a large bulk to try to get what it needs. And it also gets its food too fast. From birth the baby should work for its living. Milk from the nipple comes drop by drop and only after some effort, and is swallowed mixed with saliva. All nipples have too big a hole and are too easily milked. The result is, the child's belly is poured full of a particularly hard casein without salivary action, and cakes there into a cheese. Even some adults cannot drink milk when they can sip it slowly and digest it. In dairy countries it is often a practice to teach calves to drink skimmed milk from a bucket. They gobble it up, are ravenously hungry all the time, eat large quantities, and yet are ragged, weak, thin, stunted,

and undeveloped. They hover on the line of actual starvation, and are spoken of as being "knocked in the head by a churn-dasher." I wish every advocate of artificial feeding could see a few and compare them with his babies. I assure you he would see many points of resemblance.

Patent foods all contain starch, which the baby cannot digest for months; neither the salivary glands nor the pancreas functionate their peculiar principle for three or four months after birth. If they are malted, they have too much carbohydrate and almost no animal fat, and the proteids are not of animal origin. Albumin and proteid of vegetable origin may be identical chemically, but are not practically equivalent to those of animal origin, and the baby's belly is a poor test-tube.

Bottles and nipples must be boiled daily and kept absolutely clean. A plain flask with simple nipple very stiff, with a minute hole, is the best. In washing bottles, they should be well rinsed out with cold water first, as heat coagulates the milk and renders them harder to wash.

The great difficulty is to get pure milk, in a city especially. There is no advantage in having the milk from one cow. Unless you know all about the cow, you might get the tubercular one. Take the best milk you can get, and from the cleanest place and as soon after milking as possible. It is best cooled by ice at once. Milk, to be pure, should be taken from a gentle cow in prime of milking and life; teats and udder must not be sore and must be washed, as well as the hands, before milking. It should be rapidly milked into a clean pail, in a clean, dustless place, strained into sealed bottles, and at once cooled. Plenty must be taken, at least one quart per day, and delivered with the least possible agitation and as soon after milking as may be. Such milk needs no pasteurization or boiling.

It is very important that the baby be fed regularly and stated amounts. Crying in such children cannot safely be stopped by feeding. They require food every two hours during the day and twice in the night. During the first week, one ounce; to fourth week, two and a half ounces; three months, four ounces; six months, six to eight ounces. General diet should be commenced early.

It is usually customary to add milk-sugar, but this is more liable to ferment, and it seems equally as well to add cane-sugar. A little salt added is also good, since cows' milk is lacking in sodium chloride.

Lime-water should be avoided.

The points deserving especial emphasis are:—

1. Not to overfeed.

2. That it is the casein that causes the trouble; therefore it must be about in the right proportion.

3. The proteid element must be weak, and only gradually worked up as the child can handle it.

4. Condensed milk is too sweet and requires no sugar. It must be diluted twelve times, and is often better than poor cows' milk.

5. The baby's stomach at first is a mere receptacle for food. The bile is proportionately greater than in adults, to handle fat. There is but little intestinal digestion, but great absorption.

6. What you get from the baby is more important than what you get into it. When the mill is turning out a good, golden yellow material, with fair returns as to frequency, be contented, all is well.

Don't be afraid to use castor oil freely when a diarrhœa occurs, and so rapidly clean out all irritating material. You are thus helping nature. At the beginning of trouble it is often wise to stop all feeding and give nothing but a white of egg and water for a day or two, resting the tract absolutely. Then cautiously begin a modification very low in proteids, and feel the way up. At the New York Baby Hospital, Dr. Holt is feeding malt-soup with good results, and is also using glauber salts instead of castor oil. To a six-months'-old baby, 1 drachm of a solution (15 to 60 grains to the ounce) is given every hour up to five doses.

Medication for stopping diarrhœa or summer complaint is a failure and disappointment. You can't take a gut chronically irritated and deaden it or hinder its peristalsis to any good purpose. It has the diarrhœa because nature can stand it no longer and is trying to get rid of the irritant. Help, then, rather than hinder. The great trouble is that there can be no absolute analysis of milk, for each child has its own idiosyncrasy.

To sum up:—

1. Nothing can replace human milk to give normal children.

2. Anything but milk is a foreign substance, and we are forced to modify cows' milk, which is not the same qualitatively, chemically, quantitatively, or clinically.

3. When the trouble comes, it is hard to determine the factor at fault and it is a poor time to experiment on a sick baby.

4. Commercial milk is always old and stale. The pollution rather than the constitution may be at fault; pasteurization kills

the germs but does not neutralize the toxins, while boiling changes the milk entirely.

5. The very ones who need modified milk the oftenest are the poor, the ignorant, and the dirty, who cannot follow any complicated directions.

WEANING.

In Oriental countries, where milk and other soft and suitable food for the child are hard to get, it is customary to nurse until two or three years old. In rural districts occasionally one will meet children of two years still nursing. One reason for this is the prevalent belief that a nursing woman is not so liable to become pregnant again. The proper time for weaning is when the child is about nine months of age or after the incisors are erupted. The teeth have shown a fitness for other food, and about this time the woman's milk begins to deteriorate in quality and quantity. The season of the year has considerable bearing on the subject, it rarely being advisable to wean during the hot summer months, though in California no attention need be paid to this. Some time before weaning the child should be prepared for it by more and more spoon-feeding of bread and milk, but particularly of egg; but when it is decided to wean, it should be done once for all. It is not right for the woman to stand the strain longer than the good of the baby demands. Wean gradually—four to six weeks' time—for mother's comfort. If kept up beyond the physiological time the mother will become weak, anæmic, nervous, sleepless, emotional, with pains in the back and the general condition of "worn out." No food will help this as long as nursing continues.

Occasionally the child about this period will wean itself and prefer other foods.

Menstruation is established before the end of lactation and has no bearing on the milk. If the woman becomes pregnant before the end of nursing, the child should be weaned at once. She cannot support two with safety to herself or the second child.

Anæmia, phthisis, or other general diseases may require weaning long before the ninth month period, but every day the child can nurse up to the fourth month is an added assurance of its life and normal development.

CHAPTER XII.

ATTENTION AT LABOR.

MECHANISM OF SHOULDERS.

THE mechanism of the shoulders still seems to be in considerable dispute, or at least the practice at this point is not settled. I have taught and believed that the posterior shoulder is the normal one to deliver first. That there is a doubt the following quotations will show. For example, the "American Text-book" (vol. 1-424) says: "The head should now be held in the hand to keep it in the axis of expulsion. Contrary to the usual teaching, the writer prefers to deliver the posterior shoulder first."

Webster, in his "Obstetrics," is silent, but on page 233 has a cut of the posterior shoulder first.

Hirst says (page 306): "The expulsive force still acting, the anterior shoulder appears under the symphysis pubis, the posterior shoulder shortly after sweeps over the perineum and escapes, the anterior shoulder follows it," etc. But on page 202 there is a cut showing the anterior shoulder showing at the vulva and the head very poorly supported.

Edgar recognizes a controversy on page 482, and says Lefour believed the posterior the rule, that Auvard in twenty-nine cases had posterior sixteen and anterior nine times; but, on the other hand, that Leonet asserts the anterior ninety out of one hundred times if the head be not supported, and posterior ninety out of a hundred if it is supported. According to Edgar himself, the posterior shoulder is born first three times as often in primiparæ as the anterior, and two and a half times as often in multiparæ. He acknowledges supporting the head, of which later. Farabeuf and Varnier (page 70) state that the anterior shoulder engages as the head, "when the arch has been passed by the projecting deltoid it (the symphysis) is applied to the wall of the thorax as in the case of the neck. Now the distance from the wall of the thorax to the swell of the posterior shoulder is reducible and is less in diameter than the dilated coccyx-pubic distance. So the posterior shoulder, by a movement of inflexion or lateral flexion, renders it possible to push back the coc-

cyx and emerge from the outlet." Here we evidently have the anterior shoulder described as emerging first in the normal delivery.

In contrast to these, notice Meggs (303), who gives a clear and perfect description of the posterior first: "A renewal of uterine effort forces the left shoulder (L.O.A.) to glide off from the apex of the sacrum and coccyx, and displace the perineum, which it thrusts backward out of its way, until the shoulder is born. The edge of the perineum is now retired so far backward as to allow the right shoulder to disengage itself from above and then from beneath the crown of the pubic arch."

These few extracts show a difference of opinion and much ambiguity in statement of the true mechanism of the birth of the shoulders.

It seems to me that the question arises from the manner in which the head is supported after birth. The head in its descent meets with two muscular diaphragms which it must dilate: the cervix and the perineum. Both are obstructions serving the purpose of moulding the head and directing its smallest possible diameter to a constricted opening. The cervix is funnel-shaped and irregular in action, so that the head can move and apply itself to the best advantage, and in conforming to it the occiput is directed into the superior strait. The perineum is complete only on one side, and therefore forces the already flexed head into even more perfect flexion and holds it firmly up against its incomplete side, the pubic arch. It is a constant force, a tonic contraction, and cannot naturally admit of any other action than to firmly hold against the arch a fixed point while the lower portion slides in the segment of a circle. If the centers of a circle be taken a little above and behind the symphysis, their equal radii will represent the direction of the curve of the perineum, and for equal length we will have equal pressure at all points. While the curve of Carus is not a circle in that part conforming to the sacral curve, it is a perfect segment of a circle in that part composed of the perineum, and the center of that circle is the under edge of the symphysis. When the occiput comes down to this point it will advance no further, but the child's face is also a segment of a circle, equidistant from the occiput and resting on the perineum. There is no further distention of the perineum, and force from behind only slides out the face. That it can be done between pains proves that no retardation, other than friction, is exercised by the perineum.

What is the instinctive action at this stage common to females

of the human species? In other words, what would a woman one step removed from our arboreal ancestors do, alone in the woods? If we can get at that, then our obstetrical art must be an enlightened conformation to what evolution has proven best. During the first stage of labor she will keep moving until a quiet retreat is found. During the second stage she will be quiet, meeting each pain in a squatting position perhaps. At first her attention will be taken up in bearing down; but when the perineum is stretching and the vulva opening, her real pain is at that point and she will instinctively put her hands on the advancing head as low down as she can, retard it as much as possible, and so hold it up against the symphysis and away from the tender perineum. This holds it back until softening occurs and still further flexes the head. You may be sure she puts no pressure through the perineum either with fingers or towel. When the head is born she is in the act of holding it up, and she draws it to her breast by an awakening of the maternal feeling exactly in the well-known curve of Carus. This is not a fanciful sketch of an imaginary occurrence. All women want to keep moving during the first stage, squat during the second, and you can hardly keep their hands away from the perineum as the head is born. She does exactly what we should do to support the perineum and head. Now, the result of this will be that the anterior shoulder is held until the posterior is born, when, there being no pressure from below, the acromial process of the anterior drops slightly and slips out, followed by the body, from below the pubes.

I believe it is wrong to put any pressure on the perineum or do more than retard the head and hold it well up. This pressure must be directly on the child's scalp. It is absolutely bad to press on the head through perineum or rectum; it will only bruise and weaken the perineum. Any hooking of a finger into the baby's axilla is likewise wrong. To use force enough to be of use is dangerous. The same ends can be accomplished by pressure upon the head and a lifting of the shoulder by the finger-tips on the deltoid.

It is precisely because the modern men are forgetting the old curve of Carus, the loci of all the outlet planes, that we have such heresies as the anterior shoulder first and the hazy expressions so generally found in modern text-books; and the posterior shoulder is the largest single factor in causing the increasing frequency of lacerations they are wailing over. Let us see how this neglect of the curve affects the writers quoted. The "American Text-book" has a good and adequate description of the curve, and the author is an

advocate of the posterior shoulder, although he helps it by a finger in the axilla.

Webster has no mention of the curve of Carus, but describes the "axis of the pelvic cavity." He also advises a finger in the axilla, and "as the child's body is born it should be guided by the hands in the axis of the outlet." Hirst mentions the curve as an old and antiquated formula, but he gives the correct mechanisms of the shoulders. Edgar barely mentions the curve (420-442), with no reference to its importance. He says, "The head upon delivery is lightly supported by the hand; this support results in favoring the birth of the posterior shoulder first." On the page before is a cut showing the anterior shoulder coming first, with the head unsupported and far from

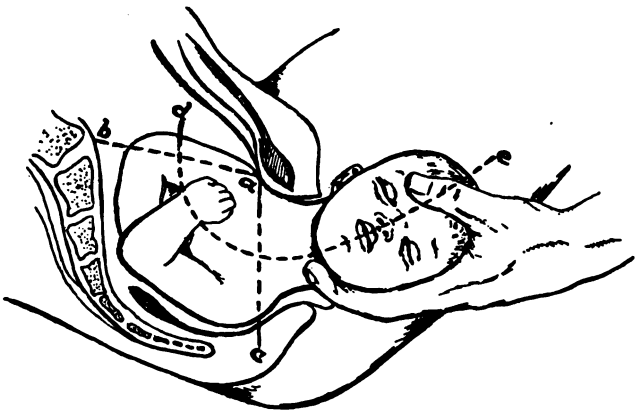


Fig. 57.—The Correct Method of Supporting the Head.

being in the curve of Carus. Farabeuf and Varnier say nothing of the curve and describe the anterior shoulder first. Good, old Meggs, of course, gives the curve of Carus, dilates on its importance, and is clear and precise in his shoulder mechanism.

Having differed from so many eminent authorities, may I be further excused in an attempt to describe this shoulder mechanism as I think it occurs in L.O.A.

After the head is born the shoulders are engaged, and are in the excavation; the right is down to the symphysis. Here the right shoulder stops and the left has to travel the sweep of the perineum. As it moves down the shoulders become oblique to the spine, or, in L.O.A., if the baby were upright the left shoulder would be raised and the right lowered. This saves considerable in the shoulder-girdle circumference. When the floor is reached, obeying the law

that it will be directed upward and outward, the posterior shoulder will be directed to the opening first. The right or anterior shoulder is all the time fast behind the symphysis and the child's neck closely applied to the arch. The posterior shoulder is pushed up and out to the child's head until the elbow is born and the lower arm free. The rim of the perineum is now on the thorax. There is but little pressure on the perineum now, and the anterior shoulder slips out. In fact, the continued force from behind tends to flex the spine and relatively lower the anterior shoulder, which is born almost simultaneously with the hips. This is supposing that the enlightened aider of nature whom the woman has called to attend her supports the head in the curve of Carus, or the woman has done so by instinct.

If the head is not supported, then the picture is changed. The head being the heavy part of the child, if it hangs over and sags on the perineum, or even if held straight with the spine, it pulls more on the anterior than posterior shoulder by its muscles, and the anterior shoulder fails to be pushed up firmly behind the symphysis.

When the resistance of the floor is reached by the posterior shoulder, the acromia are at right angles to the spine, which gives a circumference greater than the head. It must be remembered that the floor in both cases is stretched and lacking in tonicity, and is not the directing agent it was when the head rested on it. This weakness, the pull of the neck on the anterior, the weight of the head, and the right-angle position of the shoulders will allow the anterior to protrude while the posterior is hooked against the perineum behind, as the anterior shoulder should be behind the symphysis above. The shoulders are not oblique and miss that advantage, namely, a lessened circumference. But just at this dangerous point they must jump to an oblique position with the anterior forward, if the posterior does not tear its way out. The anterior can only come first by the posterior shoulder hooking against the fourchette and the anterior jumping forward during a pain. The baby is actually bent over the thin edge of the perineum and lies in the shape of a letter S, or reversed curve—a position totally at variance with a correct line of force. If the child is held up, no force from behind is expended on the perineum; but if it is bent over, then the *vis a tergo* passes through the perineum and part of it will be used in the direction of its rupture.

A well-flexed and retarded head will rarely tear the perineum. Most of all to be dreaded is the tip of the posterior shoulder.

It seems to me that we are forgetting a valuable expression in

the "curve of Carus." It is an entity that we dare not neglect. With the proper support of the head will follow a lessened number of lacerated perinei, and in no other way can the shoulders be kept oblique all the time. The circumference of the head sub-occipito-bregmatic is about thirty centimeters, and the bisacromial is 32 centimeters—very dangerous two centimeters at a very critical place. The oblique shoulders, however, only measure 27 to 28 centimeters and will easily go wherever the head can. Surely this indicates the absolute need of keeping them oblique, and the only way to do it.

Another very dangerous teaching is that we can soften or stretch the perineum manually preparatory to the head. No force can be applied so equally as the round, smooth occiput. Nor is this all; the pressure by the fingers is not continuous, but is interrupted and results in œdema and more fluid in the tissues, which mechanically takes up room. The head is entirely different, for its continued action squeezes out every drop of fluid and leaves nothing but the elastic structures, which, under the uniform and smooth pressure, will dilate to almost any size, thin out until the color of the hair can be seen through the rimi pudendi, and still not lacerate.

CHAPTER XIII.

PATHOLOGY OF LABOR.

LACERATIONS.

THESE are always pathological, and the result of some preventable condition in most cases. They are classed into lacerations of the perineum, vagina, cervix, and womb. It is a significant fact that the nearer the child reaches the world, namely, the easier for the physician to interfere with its birth, the more frequently do the parts lacerate. The obstetrics of the future will advance on the line of a better understanding and prevention of these accidents, which are always annoying and seldom free from danger.

Laceration of the Perineum.—This condition is infrequent in savage races, and becomes more common as civilization is acquired. The child-bearing period being continuous with the full female maturity, ceasing prior to the changes induced by age, and being a physiological process, should be free from traumatism. It is not proper to dismiss them as common accidents that happen in the hands of every one, but each should be studied and one's methods examined to see if no lesson can be learned that will prevent a like recurrence. Some laceration of the fourchette in a primipara is no doubt as physiological as the rupture of the hymen. Woman is the only female delivered on her back. This accounts for many tears, but seems necessary to prevent contamination from the rectum. On the continent the decubitus is usually lateral. Personally, I see no advantage in this and prefer the dorsal. Nowhere else do we operate on a sterile field in such close proximity to a septic region, not only septic by nature, but discharging septic material at critical times. A hard bed is imperative, whichever posture is preferred.

The fourchette is torn in 61 per cent. of all primiparæ, and the perineum in 34 per cent. of all primiparæ and 9 per cent. of all multiparæ—the price we have to pay for the enlarged heads and dwindling bodies of modern mentality. I do not mean to state that laceration is avoidable or happens any less frequently to me than to any one else; but I constantly strive for better technique and a nearer approach to normal conditions.

Lacerations of the perineum are divided, according to their severity, into four degrees:—

1. Postvulvar, through the commissure into the perineal body.
2. Through the perineum to the sphincter ani.
3. Through the sphincter ani into the rectum.
4. A very rare condition of submucous laceration of the perineal body.

They are never in the median line, but inclined to either side. The results are far-fetched and do not appear early. The lack

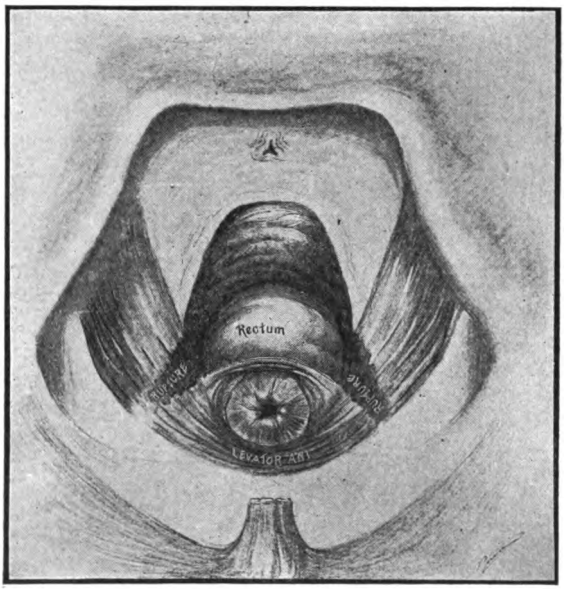


Fig. 58.—Lateral Laceration of Perineum. Sling-like Action of Levator Ani Destroyed. (GILLIAM.)

of support to the womb and fecal mass will result in rectocele and cystocele, and retroversion and prolapse of the womb as it wedges its way into the pelvis. The strain on the ligaments impedes circulation, endometritis is set up, and a long train of evils started that the art of gynæcology is called upon to treat. Were there no lacerations, that specialty would hardly exist.

The function of the perineum is to

1. Fill up anatomical space.
2. Give attachment to the levator ani.
3. By lifting up and drawing back over the head and fæces to

actively aid in expulsion and assist in defecation, acting from its central point.

The causes advanced for laceration are:—

1. Relative disproportion of head to vulva, the result of civilization. This may be suspected by noting the size of the father's head,

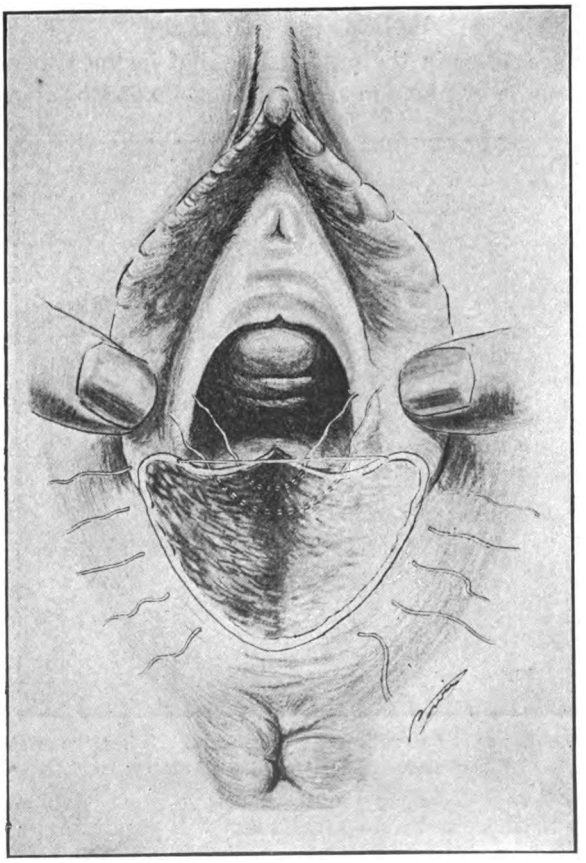


Fig. 59.—Perineorrhaphy for Incomplete Laceration of the Perineum. (Hegar's Operation.) (GILLIAM.)

to which size the baby's usually conforms. It is not so often that the head is too large as that the force is unequal and the axis wrong.

2. Too rapid expulsion by tumultuous pains before the perineum can stretch.

3. Abnormal mechanism that pushes the head back on to the perineum.

4. A straight sacrum.

5. Straight-shanked forceps or those of wide lock.

6. A straightening of the legs and a backward throw of the body as the head is born.

7. Most common of all—the unsupported head sagging over the perineum and laceration by the posterior shoulder.

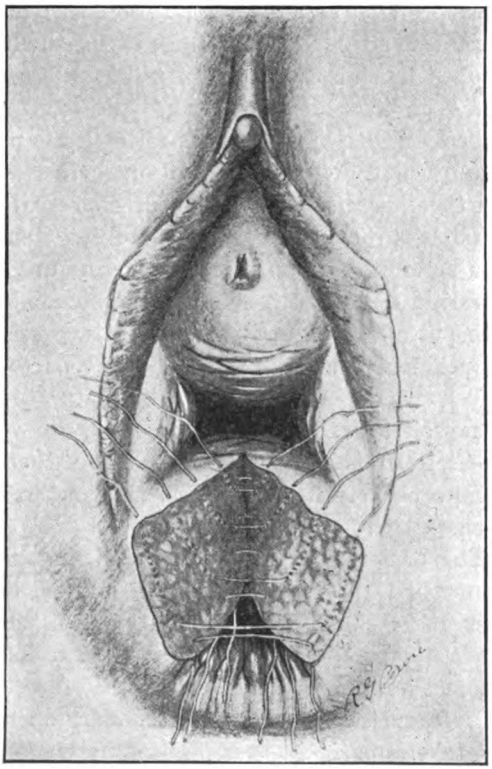


Fig. 60.—Median Laceration of the Perineum, Extending up and Involving the Septum. Rectal and Vaginal Sutures Placed. (First and Second Steps.) (GILLIAM.)

8. The shape of the perineum and sacro-curve—a retort-shaped rather than a wedge-shaped perineum—that allows the action of force to impinge on the perineum rather than the opening.

M. Chateau and Dr. Cole both report cases, where, because of an imperforate hymen, the child split the perineum and was delivered by the anus.

In the first class, if sufficient warning is given, it is best to anticipate the tear by a clean lateral cut. In the second class of cases the pain should be controlled by chloroform, and the head held back by pressure and delivered between pains if possible. In the third class of cases the abnormal mechanism should be corrected. In the fourth class a support of the head by the hand in the vulva. In the fifth class the laceration is from the side-to-side motion and involves the posterior part of the vagina, for lacerations are always at right angles to the stretching force. In the sixth class the woman must be controlled by chloroform and urged by every means to control her pains. The "bear down, darling," idea is all wrong and the puller should be discarded with the formation of the perineal tumor.

Many cases of mild degree of lacerations cure themselves if the knees are tied together, but this will never happen if the muscle is torn. For three days the lochia is sterile, and if stitches are not put in at once it is better to wait until the woman is up. Only tears of the first and second degrees can be stitched immediately; the third is always to be put off. Catgut is the best suture material. In the repair of the perineum there are three essentials to remember:—

First.—Go well out, so as to sweep in the grasp of the needle the retracted muscle-ends.

Second.—Close so closely the vaginal surface that no lochia can get in and form a pocket of pus in the perineum. It must not leak from the vagina.

Third.—The bruised vagina is always œdematous and swollen, and stitches must be tight, or clamped with shot and tightened later.

Remember that scar tissue will not make a permanent cure. The muscle-ends must unite to hold it up, or a rectocele will result later. The rectocele is the commoner, since the force of the head is backward and it is more stretched. In secondary operation this rectocele must be taken up.

For old tears there are two types of operations: Emmet's denudation and Tait's splitting. Where there is room between the vagina and anus I prefer Tait's. A dimple marks the end of the retracted muscle, which is high up and always more plain on one side than the other. If of third degree, it is more a gynæcological topic, but the gut must be repaired first. Two operations are better and surer than to try and do it all at once, as the wound is always infected. If gut is cured, *i.e.*, the sphincter healed, it is then a case of second form to do later. Again, if the head can or does slide on the perineum, it will not rupture; but when pushed ahead or the

perineum unstretched, or nature's lubricant is lost, or a shoulder catches it, it will surely rupture. Don't examine too often, or wipe or wash away nature's lubricant, which is very important.

Laceration of Vagina.—The adult female has a vagina funnel-shaped and narrow below. After the menopause it is reversed and is wide below, the result of senile change and stretching. Tampons

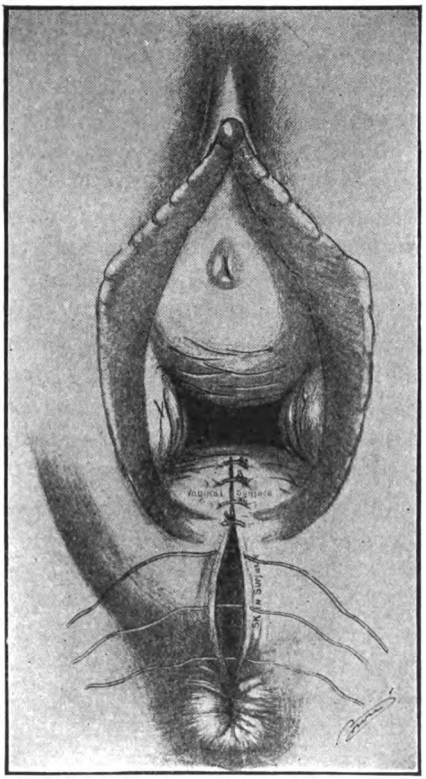


Fig. 61.—Median Complete Laceration of the Perineum. Rectal and Vaginal Sutures Tied, and Skin Sutures Placed. (Third and Fourth Steps.) (GILLIAM.)

will not hold well in old women. This makes all tears of the vagina happen at the outer third, usually in connection with the perineum. As at the perineum, it is transverse stretching that tears, and it is at the union of lateral and posterior walls as a rule.

The causes of lacerations of the vagina are:—

First.—Wide-shank forceps and side-to-side motion.

peritoneal emphysema has been met with. If child remains in the womb, it does not change shape. It may escape into the cavity. The site of the tear is tender, and peritonitis is at once set up. The child, as a rule, dies very soon and its heart-sounds cease. The tear is usually three to four inches long, in the posterior lower segment, and runs up to and toward the left side into the body of the womb. It is, of course, always in the lower segment. If, in spite of strong pains, the part does not engage in two hours, look out for Bandl's ring, and especially if the child lies obliquely; then instant ending of labor must be done.

Another sign of danger is a tension of the round ligaments at each pain. It means the womb is not settling down, but rising up.

Before rupture the treatment must not increase the pressure, *i.e.*, version never and forceps rarely are to be used. Something should be done before the woman reaches this point. If threatened, give chloroform to the point of stopping all pains. In mild cases gently apply forceps if the head presents. Some even deny this. Get the woman to the hospital and do a section, if child is living. If the child is dead and head available, then perforate. When you operate, do a Parro operation and prevent any more accidents.

When the womb has ruptured, it is of little matter whether the tear is one or twenty-one inches long. The danger is from sepsis; therefore keep your hands out. Tampon vagina instantly to keep up the gut and prevent entrance of air and septic germs; then get the woman to the hospital and operate at once. She is exhausted by shock and blood-loss, but you cannot wait for reaction. Sutures will not hold and a Parro is her only hope. She is in no condition to stand sepsis. I think it is Dorland who says hospital cases are of four types:—

1. Hopeless cases—rapid pulse, dyspnœa, precordial distress, nausea, vomiting, cold sweat, and collapse. These are profoundly shocked and will all die.

2. Cases that have lived until sepsis and peritonitis have come; they may not have given symptoms until then.

3. Cases recognized when they occurred, and in good condition to operate upon.

4. Cases never recognized as such, but considered a septic puerperium. Here open the body and remove the womb and treat as sepsis.

Of complete ruptures 86 per cent. of mothers and 71.5 per cent. of children die. According to another, 90 per cent. of the women

and 95 per cent. of the children. Ivanoff's cases, given before, 79 per cent. of the women died; children, 87 per cent. Another reports 60 per cent. of the women and 92 per cent. of the children, the very best of all statistics. In nearly every fatal case it is sepsis that kills the mother.

Every complete rupture must be sutured or the womb removed, or the woman will die. The incomplete may sometimes recover without operation.

To sum up:—

1. In threatened cases get the child out, if possible, without increase of pressure.

2. If the conjugate vera is less than 8 centimeters, section is required; over that, forceps possibly.

3. If child is dead, perforate.

4. After rupture, tampon vagina and get her to a hospital.

5. Deliver child by vagina if possible; the tear is not made worse thereby.

6. Perform a Parro. Conservative surgery leaves a scar and future rupture. The vagina is not a good route for this work—open abdomen and flush out all clots.

7. Watch for Bandl's ring, or irregular uterine quadrant, retraction of parts, tightening of round ligaments, shock, concealed or open hæmorrhage, stopping of pains, pain and shock, blood percussed in flank or side-to-side succussion, and use forceps two hours after no advance of the head.

Lacerations of Cervix.—Some laceration is done in every primipara which leaves a trace behind. It is therefore physiological. Deeper tears are the result of labor before dilatation has occurred, or from violence by instrumentation. They may be longitudinal or circular, multiple or single. The circular artery may be torn, which is equivalent to a subperitoneal laceration of the womb, but it usually heals spontaneously and causes little or no symptoms afterward. Their only danger at the time of dilatation is that they tear into the body of the womb, or at least as far as the circular artery with resulting hæmorrhage. Diagnosis is by palpation and inspection. They are better repaired, when they require it, a few weeks after labor than at the time. This is contrary to most of the modern teaching, namely, immediate repair of the laceration. But the woman is in no condition to endure further manipulation, and with the utmost care more or less sepsis is almost inevitable. In repairing the lacerations of the cervix, the anatomical relationship of the ureters must be kept in

mind, the more so as they usually lacerate to one side. It is not necessary to examine the woman merely to find out if the cervix is lacerated. There is no advantage in the so-called intermediate operation—five days after labor—it should be done either at once or later.

Inversion of the Womb.—This is one of the rarest of obstetrical accidents. So rare that, in the Rotunda Hospital, in over 190,000 births during the last 123 years they have had but one case. The causes are considered to be:—

1. A short cord.
2. Upright position.
3. Paralysis of the womb, with a heavy placental site which falls, and, acting as a foreign body, is itself expelled.
4. Pulling on the cord to get the placenta. This is perhaps the most common reason. Or
5. Poor attempts at Crèdé's method of placental expression.

There is at once shock and great hæmorrhage, and the appearance of a round tumor in the vagina or protruding from the vulva, with absence of the womb from its normal site. It must be put back at once or she will die in a few hours. There is no time to stop and revive the patient. The bladder should be emptied if there is any urine present, and the tumor compressed and pushed up in the curve of the pelvis. The sooner it is begun the easier it will be restored. A steady pressure must be kept up until the organ is tired, and, once the fundus can be bent through the constricting neck, the rest is easy.

CHAPTER XIV.

PATHOLOGY OF GESTATION—MATERNAL.

DISEASE DURING GESTATION.

THIS will only be superficially touched upon. The woman may have every disease while pregnant that she would have had during the same period otherwise. The lines of treatment differ but little. The most serious conditions are the fevers. It is taught that a woman will abort if she has small-pox or if she has some other disease, when it may be summed up by saying that a fever, especially if lasting a day or two, is generally followed by miscarriage. Under causes of labor I advanced the effect of temperature of the fœtus as one of the causes. The same is shown in any rise of temperature if continued; it will inevitably abort the woman.

Quinine has been classed as an abortifaciant, and caution advised in its use. From a long experience in malarial districts I believe this untrue. Quinine will stimulate the acting womb because of its general stimulation, but it has no specific action on the uterine muscle. It can be given in the usual large and continued doses for malaria with perfect safety, and is far safer than a spell of exhausting chills and fever.

The irritating purgatives it is well to avoid. Contrary to the belief of the laity in French pills, I know of no drug that, short of a poisonous dose, will bring on a miscarriage. At one time or another I think I have seen women try every possible remedy without success.

Phthisis, if advanced, should, as a rule, mean an induced miscarriage. The disease may apparently rest until labor, but it is the last effort to reproduce and the after-decline is rapid and sure. There is no hope of a cure in such a woman if pregnancy is allowed to continue, for all her energy is but too little to encapsule the germs.

During pregnancy there is less chest expansion, but the lungs are broader and shorter. The capacity is about the same, but there is increased elimination. Pregnancy does not cause tuberculosis, but relapses are caused by it; in fact, it seems to render a temporary immunity. It will not abort the woman, but the condition is bad for the disease. She will bear the first child well, the second with difficulty, and the third never. Such women should not marry; but if they do,

should endeavor not to become pregnant. Schmorl has proven that the bacillus will penetrate the placenta, but it is usually thought that tuberculosis is acquired and never hereditary.

Malignant diseases anywhere call for abortion or operation, if the mother is to live.

Glycosuria may arise at any stage, or be then first noticed. It is very destructive to the child. If it is acute, half the women will die. It is not associated with eclampsia. More favorable is it when it antedates pregnancy.

A great diversity exists as regards the significance of **heart disease,** from holding it an extremely grave symptom to a matter of little importance. Heart lesions are always of uncertain prognosis. Their existence is usually known and the queries of husband or patient must be answered.

Tuszkai has grouped the cases into classes with reference to the prognosis:—

1. Cases when the lesion existed before pregnancy, in which the outcome is usually bad.

2. Cases when the strain of pregnancy has awakened a latent lesion. The prognosis depends on the prior disease and is either very good or very bad.

3. Slight heart lesions due to the condition. These are usually functional in character, and in them the prognosis is good.

It is a matter of compensation. If this is present, there is nothing to do but shorten the labor and save the heart as many hours of strain as possible. When this compensation is lost, then to save the life of the mother the pregnancy should be terminated. My personal experience is that the condition is not nearly as bad as the text-books would warrant one in assuming, if the patient comes under the care of her physician early enough and is put to bed with appropriate treatment. Cases of mitral stenosis are the worst. The second stage should be shortened by the forceps, and even chloroform need not be entirely contradicted.

Pyelitis is a not infrequent and dangerous complication of pregnancy, first described by Rebland in 1892. It is an ascending infection of the colon bacillus usually, the result of two factors: first, compression of the ureter; second, infection above that point.

From its anatomical position, *i.e.*, the greater prominence of the right common iliac at the brim of pelvis, the usual L.O.A. position and the uterine rotation on its axis from left to right, the right ureter is most commonly affected and the pelvis of that kidney dilated. For

the same reason, namely, pressure, it comes late in pregnancy, at the fifth to eighth month. The symptoms are few and are in the beginning those of cystitis. There are pain and pus in the urine. Chills and temperature from 100° to 105° for a week or more. The urine is acid, cloudy, and has pus, casts, and albumin, as well as many colonies of bacteria. There may be some pain in the kidney, but it is more often referred to some other part of the abdomen, at McBurney's point or over an ovary. Were the abdominal symptoms considered alone, it might easily be mistaken for typhoid or malaria, appendicitis, salpingitis, or cholecystitis. Its treatment demands rest in bed and an absolute milk diet. Abundance of water must pass, to wash down the products of inflammation. The pressure should be removed as far as possible by bandages and position, and the urine kept saturated with antiseptics. The prognosis is grave, and in many cases there will be no improvement and emptying the womb will be imperative. Some 20 per cent. will spontaneously abort.

A **diabetic** woman will not conceive, or, if so, will not carry her child to term. A little sugar is almost physiological if the mammary glands are functionating, and if they are suppressed the sugar will be increased. This sugar is in the form of lactose and is not of hepatic origin. About 22 per cent. only of women are entirely free from traces of sugar or albumin. This condition is serious if a true diabetes is present, as shown by the sugar with an increased flow of urine.

Retroflexions and retroversions should be replaced and mechanically supported until the womb rises. Knee-chest position will replace them.

Ventral fixation should never be done during the child-bearing period. When present, it is followed by some trouble at labor in 25 per cent. of the cases at least. No operation will fix the womb and still allow it its essential function of movability. During pregnancy all artificial ligaments are uncertain and sure to stretch, nor can the result of any operation be foretold.

The complications met with from such an operation have been:—

1. Retraction of scar and constant pain at its site.
2. A tumor mass in front, obstructing birth.
3. Retraction and displacement of cervix.
4. Excessive thinning of the posterior wall.
5. Persistent and great nausea, leading up to abortion and premature labor.
6. A prolonged pregnancy.

During labor we may expect:—

1. Uterine inertia or feeble pains from a thin wall or vicious angle of force.

2. Some tumor mass preventing delivery.

3. The displaced os cannot be dilated normally.

4. A rupture of the fixation scar.

5. Abnormal presentation, transverse especially, and prolapse of cord or fœtal parts.

6. Rupture of the thin uterine wall.

7. Peculiar sacculations and retraction rings.

Vomiting of pregnancy may come from three causes:—

1. A reflex from the uterus.

2. From the nervous system being in a high condition of stimulation from circulating products.

3. From local stomachic causes.

The first is physiological in every pregnancy. All anomalies of position should demand correction, and uterine excitement, especially vascular, be allayed.

The second is more serious and is of the nature of a toxæmia, into which it shades. The nervous system must be quieted by chloral and bromides, cold to the spine, and elimination.

The third is the result of over-eating or a diet that is improper, and possibly gas pressure. There is normally an over-acidity, which may be the sole cause and yield to alkaline drugs. It is always worse in primiparæ.

If it is regular and in the morning upon rising or after coitus, it is probably of the first class and requires but little treatment other than mentioned. The second is more serious. The vomiting is persistent and it is usually in the middle or later months. It is marked by an increase of pulse to 120. If the pulse goes to 130 or 140, the woman will die unless aborted. In these cases a danger symptom often seen is a brown or black vomitus identical with that of sepsis. This is a true toxæmia. The third class is a nausea and vomiting *after meals* irregularly and associated with symptoms of indigestion. Care in food and rest after eating, with bitter tonics and alkalines, will usually end the trouble.

Syphilis should be vigorously treated, but is usually followed by abortion. The first child suffers the most and is a constitutional syphilitic from conception.

A late primipara—over thirty years—is liable to some trouble, though not as much as usually thought. Her labor is longer by a few

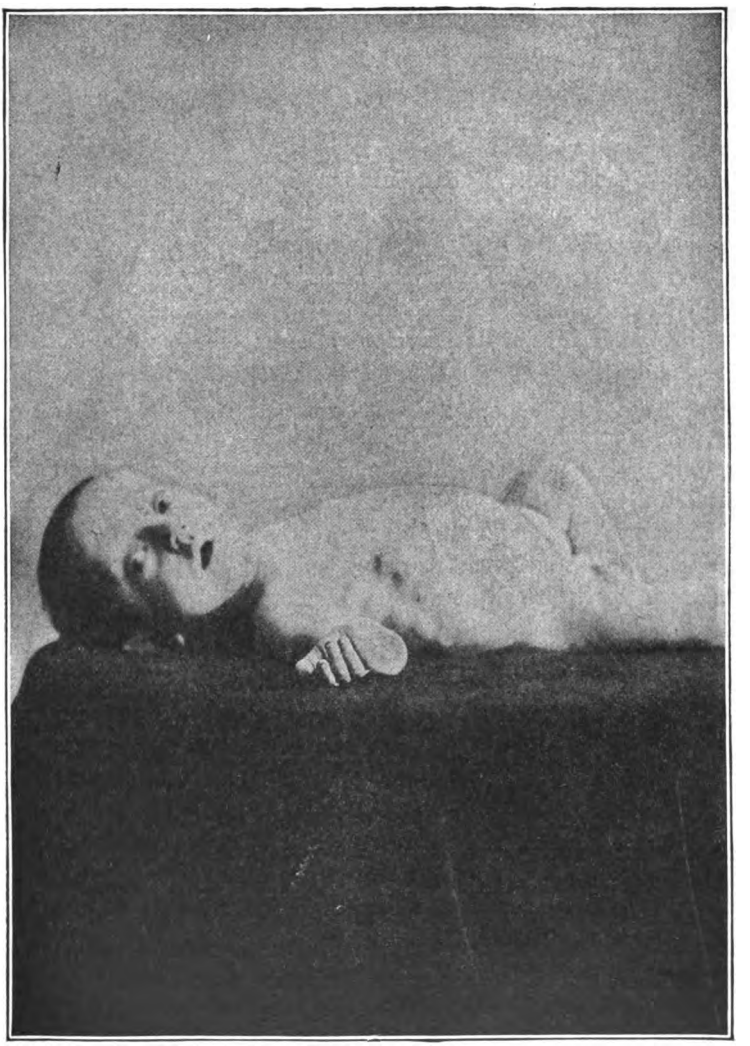


Fig. 62.—Rickets, showing Beaded Ribs. Breast-Fed Infant with Poor Hygienic Conditions and Delicate Mother. (From Children's Service of German Poliklinik.) (FISCHER.)

hours, and lacerations are slightly more common. Forceps are required a little oftener, and she is more affected by it in the way of nausea, eclampsia, etc. It is also said that males predominate and twins are more common. In reality it seems to make but little difference, and none in any given case.

Gonorrhœa requires prompt treatment for the baby's sake more than the mother's, from danger to its eyes at birth. It is present when least suspected. I shall only speak of it in its obstetrical bearings. The pus of gonorrhœa is alkaline, while the normal vaginal secretion is acid, and it is to this acidity that the sterility at labor of the vagina is largely due. Every effort should be made to cure it as long a time as possible before labor.

Gonorrhœa has litt'e bearing on sepsis unless mixed with other germs, and there is no proof that it renders them particularly virulent except in altering the vaginal secretion and its antiseptic power. It does, however, affect sterility in percentage estimated as high as 70 per cent. This is the result of endometritis and salpingitis, which unfit the membrane for passing and retaining the ovum.

It is upon the child that its fury is expended. One-fifth of the world's blindness is from this cause, and the great majority of those blind from birth are so because of gonococci. It deserves from this alone to rank as one of the great scourges. Some one has said: "Our present social conditions and the physiological passivity of woman in the sexual act make her all too often a sacrifice. Her first coitus is but the passing by the husband to her of a gonorrhœal infection acquired from some outcast." "Virtuous and pure-minded herself, and too innocent even to suspect her husband, of whom she knows but little, she links the two half-worlds and is inoculated with the most loathsome known disease. She may become broken in health and have to undergo the knife, or she may bring forth a child an object of pity to mankind and endless misery to herself, or she may lose the power of procreation, so dear to every female heart, and live a lone'y, soul-gnawing life, pitied by her more fortunate sisters, suffering a hurt for which no soothing word of pity can ever be expressed." The wail of misery that is arising to the ears of the Almighty for vengeance is but too often started in some such unsatisfied heart. The apparent evils of "clap" are well known to you. You may pity the man when his "exciter to crime is weeping with drooping head, repentant and sick"; but don't forget that some one of God's fairest creation is probably suffering through him, or an innocent child is deprived of ever enjoying a view of the glorious creation or reciprocating a look

of mother love or seeing there the reflection of divine love. Gentlemen, we too often joke on this subject and fail to condemn a marriage when one of the parties we know has led an irregular life. We, too, are guilty unless we boldly and repeatedly lift up our voices against the habits that spread this fell disease.

A troublesome **pruritus** of the vulva is a sequel of leucorrhœa. In very rare cases it seems a neurosis, or so we class it. Absolute cleanliness must be secured, and some wash given to allay itching. I don't like salves. The parts are hot and moist and excoriated, and ointments only retain the secretions. A lotion, as carbolized water, is much better.

Serious wounding of the womb has taken place from injury by sharp instruments, horn of cattle, etc., without interrupting pregnancy, and their treatment must vary with every case. The womb will stand a great deal of injury. Necessary surgery may be done on the pregnant woman if a menstrual anniversary is avoided. Chloroform is safer than ether as an anæsthetic, having a less damaging effect on the kidneys.

There is one thing that will produce a miscarriage, and that is cyanosis from any cause. For this reason particularly nitrous oxide must not be given in dental work during pregnancy. It is better to avoid any operation involving the fifth nerve while in this condition.

There are no diseases of the skin peculiar to pregnancy, but such great metabolic changes influence all. There is a tendency to hyperhydrosis of the skin from increased secretion. There may be urticaria from toxins in the blood, or eczema of the skin from venous stasis. There is also a tendency to a deeper pigmentation of any existing eruption.

CHAPTER XV.

PATHOLOGY OF GESTATION—FŒTAL.

INFLAMMATION OF THE DECIDUA.

THESE are rarely or never diagnosed prior to labor or miscarriage, and in nearly every case result in the death of the fœtus. There is no treatment, nor will it be possible to treat it until the subject is better understood. The acute forms are the most fatal to the child; some of the chronic may not be. According to the pathology, we may have an acute infectious, hæmorrhagic, and purulent deciduitis. Chronic catarrhal, which becomes cystic and may rupture and leak for weeks, when the condition is often mistaken for the liquor amnii and the onset of labor expected. It is the least harmful to the child, which has a probability of going to term.

Chronic hyperplastic deciduitis results in a large, thick decidua, usually fatal to the child, and may be retained as a large mole. If the condition is localized we have chronic tuberous deciduitis. There is also a chronic cystic deciduitis. Apoplexy may occur and the whole mass be aborted as a "blood mole," or, if it be retained, will become calcified as a "stone mole." The decidua may atrophy or form a deciduoma (non-malignant) and decidua malignum, spoken of under a different head. These definitions are but names of types of inflammation.

DISEASES OF THE CHORION.

We may have here a cystic disease or hydatiform mole, which is a myxœdematous degeneration of the wall. The etiology is unknown. The fœtus is killed but is rarely aborted. The condition is only recognized late when the womb becomes abnormally large for the time of gestation and profuse and exhausting hæmorrhages occur. The treatment is an emptying of the womb and curettage. There are also a fibro-myxœdematous change and a chronic choritis with fibrous adhesions. The treatment is to empty the womb.

DISEASES OF THE AMNION.

No disease of this organ can be diagnosed from the other layers or before examination. Judging from the results, we are able to determine the following conditions:—

1. A plastic exudation with adhesions to the child or to itself, which is a great cause of monstrosities and intrauterine amputations.

2. A thicker than normal amnion that will require rupture in the second stage.

3. Cystic degenerations.

4. Abnormal thinness and too early rupture.

5. Scant water, causing dry labor.

6. Thick and colored water.

7. Hydramnios, or excessive amount of fluid. Instead of the one and a half pints normally present, there may be quarts. This may appear quite suddenly, or develop over a period of months. In one case thirty liters were seen at the sixth month. This condition is fairly common, occurring about once in 300 pregnancies in multiparæ, and twins especially; very rarely in primiparæ.

The causes could only be:—

1. Fœtal.

2. Maternal.

3. Amniotic.

On the part of the fœtus, it would come from urine voided. Maternal would come from obstruction to the circulation, causing a localized dropsy, or from a tumor or degeneration of the decidua obstructing the circulation. To sum up, it is circulatory obstruction or fœtal urine. It is usually on the part of the mother and associated with evidences of hydræmia. Both acute and chronic forms are met, and the condition forms a dystocia to be further mentioned. The symptoms are a rapid increase in size and pressure. The fœtus is freely movable and its sounds hard to hear. A fluctuation is present and must not be confused with a possible ovarian cyst. This can be told by the rhythmical contractions that will be found in the cyst wall of the uterus. It must be differentiated from ascites also. The fœtal origin is denied on the ground that, while the child does urinate, it is at no set time, real renal function beginning at birth, and the pressure would prevent much being voided. In the vast majority of cases it is of maternal origin, slowly accumulating, and rarely noticeable before the fifth month. There is no known treatment. In 50 per cent. the fœtus is born dead prematurely and is, as a rule, deformed: if at term, the labor is slow with a tendency to inertia (25 per cent. of children die).

In the placenta, prævia, congestion, interstitial hæmorrhage, inflammation, tuberculosis, syphilitic, polypus; fatty, hyaline, mucous, calcareous, cystic, and atrophic tumors; degenerations, hyperplasia,

and sclerotic changes have been noted. There is no diagnosis or treatment. The woman will abort. The syphilitic degeneration is the one great cause of abortions. Adhesions to the wall, *i.e.*, "placenta grown fast," is, if ever, seen very rarely. Such cases are merely retained placenta.

PLACENTA PRÆVIA (UNAVOIDABLE HÆMORRHAGE).

The fertilized ovum normally lodges in a fold of the decidua at the fundus and there the placenta is attached. Sometimes it does not, but is attached at the lower uterine segment, with disastrous results. The seriousness of the low implantation is proportionate to its contiguity to the cervix, and from this we have four degrees:—

1. Placenta prævia centralis, entirely over os.
2. Placenta prævia lateralis, partially over os.
3. Placenta prævia marginalis, touching the os.
4. Placenta attached to side of womb.

In frequency Jewett places it 1 to 1000; Hirst, 1 to 1200; and Lusk, 1 to 900 cases. It is much more often seen in hospital practice, many cases being sent in. In the Glasgow Maternity, in 51,290 cases it was 1 to 305.

The causes advanced for this condition are:—

1. Relaxation of womb.
2. Subinvolution.
3. Chronic endometritis.
4. Chronic congestions.
5. Lacerations of cervix.
6. Low insertion of tubes.
7. Thirty-five per cent. give histories of previous instrumental deliveries.
8. Age—one-half are over thirty years.
9. Four times as often in multiparæ, probably because some of these factors are usually present.
10. Parity, multiparæ and primiparæ as 8 to 1. Fifty-two per cent. have born four or more children. It is also more common in the poor, who make "poor getting-ups" from lack of attendance.
11. Hoffmeier thinks a cause to be the development of the placenta from the lower pole of the fœtus.
12. Hart claims the ovum only lodges where the epithelium is broken. It does not lodge in the tube, and does low down if endometritis be present; otherwise it would be lost.

The symptoms will be that of a normal pregnancy until about

the seventh month, when hæmorrhage occurs. It rarely happens before the sixth month, and usually about the seventh anniversary of the menstrual period, at which time the uterine contractions are more violent. This hæmorrhage is usually slight, only a show, and often at night, when the woman is quiet. It may be continuous, but is rarely so, most cases being successive. The more centrally located, the earlier it will begin. In the marginal and lateral wall implantation there will be no bleeding until labor. No matter when it starts,

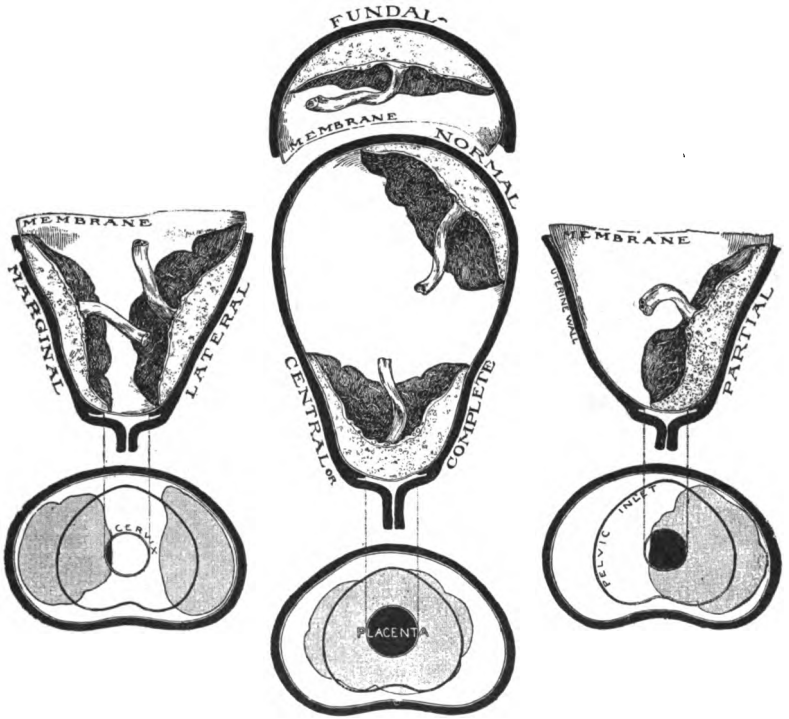


Fig. 63.—Diagram of Placental Insertions. (EDGAR.)

nor how moderate in amount, it is certain to recur and be more profuse with time and repetition, and is apt to be periodic. The hæmorrhage is a late occurrence and is due to the rapid increase in size of the womb, which strips off part of the placenta. It is very deceptive, for the blood lost may not be excessive or jeopardize life until labor, when the woman may bleed to death in a few minutes. The eighth and ninth months, with the size and increased contractions, are marked by a crescendo of lost blood.

Two theories have colored our ideas on the subject. First, that the womb was essentially composed of two parts: a fundus and a cervix. The function of the fundus was to contract, that of the cervix to dilate. If, then, the placenta were attached below this line, it would detach during labor, with hæmorrhage; if above this line, it could only be detached at labor or by an accident. This gave rise to the old names of "accidental and unavoidable hæmorrhage." The second and more modern theory is to consider the womb as of three portions: a fundus, separated by the site of Bandl's ring from a lower uterine segment, and a cervix. Uterine movement and contraction go on all the time except at the cervix. The placenta is normally attached above the part where Bandl's ring would form, and this ring is lower than the tubes. When the placenta is on the lower segment, it is called low implantation.

The placenta normally is attached about the third month, when the womb is small, and grows with it. This lower segment does not thicken and grow and expand, but only to a certain point, the limit of which is soon reached, and it strips off, with a hæmorrhage as a result. At labor the blood loss will increase with every pain. The fundus then is normal, the lower segment will give accidental hæmorrhage, while the cervix will be a true "prævia."

In low implantation the site is subject to blows and jars, kicks of the child, and leverage of the body of the womb, as well as increased blood-pressure. The retraction of labor is shown in placenta marginalis. When the cervix is dilated the placenta is actually across the opening, from retraction of the lower segment. From its location such a placenta is apt to be abnormal in shape and size, adherent, etc. The great danger is always sepsis in low implantation, the fundus being farthest removed from accidents and germs as well as in the muscular part of the womb, which will constringe the vessels.

Hæmorrhage, then, occurring after the midpoint, no matter how slight, should be given instant notice. The woman is at once put to bed and examined. If the hæmorrhage is slight, it may check; but if severe, it must be controlled by packing of the cervix, which will induce a miscarriage but cannot be helped. In fact, he will have the best results here who does not consider the child, for it rarely happens that its life can be saved, and the mother is first. Fifteen per cent of the mothers die; one-half of the children are premature that live at all; and the estimated mortality of children is 50 to 75 per cent.

If the finger can enter the cervix, it is a great aid to diagnosis.

The placental site can be felt as a thick, soft mass, with the peculiar stringy feel of placental tissue, obscuring the fœtal parts. This is usually, but not always, pulsating, and the uterine snuffle may be heard corresponding to it or at least low down. There is usually no difficulty with the diagnosis; the errors come from temporizing treatment.

There is no expectant treatment unless the woman is in a hospital under a physician's eye night and day, and then could hardly hope to go to term. The womb is to be emptied at once. No other emergency is more appalling or more sudden.

The old teaching, to wait until the child is viable, has too high a maternal mortality to be safe, and is justly abandoned. You are to do four things:—

1. Stop hæmorrhage.
2. Empty womb.
3. Secure contraction and retraction.
4. Complete hæmostasis.

The first can be done by plugging the os if the hæmorrhage is not too severe. Then, if pains set up and the hæmorrhage is slight, one can wait for a natural forcing out of the fœtus. If at or near term, puncturing the membrane and letting the head press upon the cervix is an old method of Puzos (1759). In cases of more severe hæmorrhage the Voorhees bag should be put in, and is a good tampon as well as dilator. If it is a partial implantation, the head is a sufficient tampon, but the bag in front of the head does no harm and is an added precaution. By tamponing, a mild hæmorrhage can be stopped; but in serious cases, suddenly arising, a version may have to be done to bring down the breech and so use it as a plug, but don't deliver the baby even if alive—use it as a plug after version. This is the rule in complete prævia, even to boring a hole through to grasp the foot. In partial as in marginal the head may act as a tampon. Whenever the placenta is pressed or dilated, the hæmorrhage will cease. The real loss of blood is in the interval between the pains, then only squeezing out what the relaxation allows to escape, while each pain strips off a little more of the placenta and allows more blood to escape. The stronger and more continuous the pains, the less the bleeding.

Second, empty the womb by version preferably or by forceps. In a few cases section may be preferable, done before labor. This would apply particularly to a complete prævia with certain trouble at the onset of labor. In many such cases the placenta will be stripped off

and born before the child. The womb must not be too suddenly emptied, because, first, the womb will not contract and a postpartum hæmorrhage results; and, second, the cervical site of the placenta will not dilate, but tear. The woman has lost much blood and will not stand the strain of postpartum or laceration of the womb. It is very necessary to be cautious in too sudden delivery; haste is not needed, for the head or breech is a sufficient pressure to stop further loss of blood. In rare cases she may spontaneously deliver in central prævia by forcing the placenta out ahead of the child. In 25 per cent. the cord is prolapsed.

Third, the use of ergot is demanded in every case, for there is a woman weak and anæmic, with a placental site of feeble contractile power. Constitutionally and locally these are both dangerous elements, that induce bleeding, and then, too, the danger of sepsis in one so exsanguinated must be avoided.

1. Now, the danger of immediate death from hæmorrhage should not be a great one, but the exhaustion following is real and always present. It means, at best, a long, slow convalescence, and every drop of blood is to be conserved.

2. Fully one-half of the children will be prematurely born and all more or less asphyxiated. The woman who has repeated slight hæmorrhages or "show" will not go to term.

3. When the woman is at term the maternal mortality is 25 per cent. to 30 per cent.; child, 45 per cent. Disregarding the child, it is 19 per cent. for mother and 70 per cent. for baby.

4. In one-fourth of cases the cord prolapses.

5. In 12 per cent. the placenta is adherent, requiring the dangerous expedient of its manual removal.

6. The weakened mother, open cervix, and nearness to the cervix make sepsis a very present danger.

7. A low implantation forces the head to one side into a faulty position (50 per cent.) that in itself is dystocia, the shoulder and transverse being especially frequent.

8. The labor is always hard and dangerous. The first stage is slow, as the cervix is bound down and dilatation is unequal. The pains are not efficient. The second stage is faster than normal—too fast, often—as the hæmorrhage has softened the parts.

The condition cannot be diagnosed before the third month. In the fourth it may be felt per vaginam. Fatal bleeding is very rare before the seventh month, which marks the viability of the child. It

is well, therefore, to have arrangements made to care for a premature baby after that time.

The ideal condition is where it is recognized early, and when the child is viable and the woman has lost but little blood. In a hospital after preparation, the best treatment is to rapidly dilate the cervix, previously softened by packing, bring the foot down and then allow labor to proceed naturally. This will save all the mothers and a goodly percentage of children. No bleeding can be checked by merely tamponing the vagina; it is the cervix that must be plugged. When the child is born, the placenta should be left as in a normal case, but may require separation.

Section would only be warranted when the surroundings were aseptic and the woman uninfected; a living child at about term; the os undilated and hæmorrhage under control and with but little loss of blood. The after-care of the woman will demand great watchfulness.

SEPARATION OF PLACENTA.

This is the "accidental" hæmorrhage of the old writers, now known to be due in most cases to low implantation with its greater danger from traumatism. It is a very grave condition for the mother, ranking in mortality next to rupture of the womb, and death to the child in most cases. Nearly all the children—60 per cent.—and 15 per cent. of the women die. The hæmorrhage will be open or concealed, according as it separates the membranes and appears at the os, or forms a large clot between the membranes and the wall. The concealed may be in the center of the placenta or above it, rarely below. Accidental and marginal prævia are hard to separate if late in pregnancy. Poor health, rapid pregnancies, and fat seem to predispose to endometritis and arteriosclerosis. It appears late, just prior to labor, and much later than prævia. Women with Bright's disease are more subject to it. Given a low implantation and a predisposition, *i.e.*, placental degeneration, and add to it a shock, strain, kick, or other traumatism, and this condition results.

There are shock and reaction before the appearance of blood and labor pains. The pain is usually of a peculiar tearing, as if the womb were bursting open, and is continuous. She may not even remember the blow, and passes through so mild a shock as not to be attracted by it and only knows something is wrong by the blood. A hæmorrhage for which there is no other cause is the diagnosis. In the concealed form there will be pain, sometimes surprisingly little, air-hunger, etc.,

collapse and shock, and the womb may be increased in size and nodular. From placenta prævia the diagnosis must be made by the late appearance, steady flow without stop, and absence of the placenta from the examining finger. From a ruptured secondary ectopic pregnancy no diagnosis could easily be made. It could be excluded because of its rarity. The open form is the safest to the mother. The concealed may not be recognized until the patient is dead.

The treatment is to empty the womb at once, regardless of the child, which is usually dead. The womb is over-distended and the danger is great of postpartum bleeding. The cervix is to be rapidly dilated and the fœtus extracted by version or forceps. It is important not to rupture the membrane, but preserve the intrauterine pressure until the last minute. Accidental hæmorrhage has a tendency to stop itself, and is concealed before it is open. The blood tends to strip up the membrane, not more placenta. Tears of the perineum are of no consequence, and the only safety is to reduce size and have the contracted womb shut off its vessels. For this purpose ergot must be given early and in large doses. A hot douche of acetic acid and a tight binder will be needed after the placenta and clots are removed. In many cases saline infusion and enemas will be needed. The same rule is to be used here as in a ruptured ectopic, *i.e.*, to operate without waiting for reaction or stimulation from collapse. This will only result in the loss of more blood in a woman who is practically bloodless. In prævia, on the contrary, rupture of membrane is good, as it allows the head to settle, but this is not good in accidental hæmorrhage.

MANUAL EXTRACTION OF PLACENTA.

This is one of the most dangerous of all obstetrical manœuvres. The mortality is due to sepsis. The vagina is rarely and the vulva never aseptic, and the hands are as sure and as certain to implant germs as if a loop were drawn through a culture tube. The rubber glove is a *sine qua non*.

Rosenthal, reporting 12,000 cases between 1890 and 1900, sets the mortality at 13 per cent., while section was 8.6 per cent., and sepsis occurred in 50 per cent. of the cases. In Olshausen's clinic it was 30 per cent. of sepsis, and Döderlein's 28 per cent. Without gloves, one-half die.

No great difficulty should be found in finding the placenta, as it always lies to the ventral surface of the child; were it to the back, the dyspnœa always causes the child to turn over.

CORD.

This must be ten inches long or it will cause dystocia. If prolapsed, the Trendelenburg position and pushing up will usually replace it. If around limbs and neck, it should be slipped off between pains if possible. Its size varies; it may be short, from a bar to labor up to Schneider's case, 90 inches long. It may be as thick as the thumb, but one-half inch is normal. Typically, it should be inserted centrally; but may be central, marginal, vilamentous, or lateral. It has been seen knotted or twisted in twins. It is usually twisted in its course, from fœtal turning, but I saw one case straight its full length. It may be cystic, have calcareous deposits, its vessels dilated or stenosed. There are present one artery and two veins, with semilunar valves. The veins carry pure blood. Hernia at the navel is not rare. It will stand a breaking strain of about 8¼ pounds or from 5 to 15 pounds, enough to give way by the weight of the normal baby, especially should it drop. The funis breaks most readily a short distance from the umbilicus, at about the spot usually tied.

CHAPTER XVI.

PATHOLOGY OF THE PUERPERIUM.

PUERPERIUM.

SUDDEN death from causes incident to labor is rare, and is usually due to embolism of air or to a clot lodging in heart or lungs. This is a surgical possibility. It is marked by dyspnœa, shock, weak pulse, etc. There is no way to avoid it, nor can I find estimates as to its frequency. Every man of large experience seems to have seen a case or two, and from that I should say one in two thousand labors, perhaps. The treatment is stimulation and supporting in general, and later of the aphasia, paralysis, and hemiplegia or other symptoms.

The puerperal woman is an exhausted one, and so more liable to disease. She is weak and anæmic, with lessened resistance. A tardy or subinvolution is very frequent. The womb must be stimulated to contraction by massage, faradic current, or hot (115 degrees) vaginal douches. It generally depends on a condition of poor health, and the iron and bitter tonics with rest are indicated. A recurrence of the red flow on getting up is proof that it was too soon, and she should be put back to bed for a few days. A common cause is a persistent tight binder and lack of rolling about on the woman's part, especially if she does not nurse her baby. The womb must intermittently contract to involute, and tightness, rest, and lack of stimulations from this and the breasts will act detrimentally. A binder should be loose after the first twenty-four hours.

The cause of **subinvolution** or a large womb after six weeks is some interference with its normal atrophy and absorption, by:—

1. Lack of contraction.
2. Congestion from pressure of bladder or gut, or too early sexual intercourse, or getting up too early.
3. Fibroids and inflammatory adhesions.
4. Laceration of the floor.
5. Sepsis—this is perhaps the most common of all.
6. Lack of nursing and its constant stimulation to contraction.

The womb remains enlarged, boggy, and soft. Lochia continues, and the woman complains of weight and pressure on bladder and

rectum. She must be put to bed and given ergot and tonics. A 50-per-cent. solution of formalin is used in the Rotunda with good results.

Pregnancy kidney is a condition quite commonly noticed in those carefully examining the urine of every patient. It is the result of a toxæmia not severe enough to cause eclamptic symptoms. Keep a sharp distinction between albuminuria and Bright's disease from eclampsia, in which albumin is a very late and secondary symptom. They are entirely different and arise from different causes. As transient albuminuria foreruns Bright's disease, so does this forerun eclampsia. The pathology is a fatty change in the renal epithelium, attacking, late in pregnancy, a woman with healthy kidneys. It is seen in primiparæ and twin pregnancies oftener than multiparæ and singles. It begins slowly and insidiously. There is lessened urine, higher specific gravity, casts, and red cells. With it are anasarca, retinitis, etc. A little albumin and œdema are the diagnosis. It is an autointoxication, the urine being less and the blood more toxic than normal. It is the same unknown poison of eclampsia, of which these are the beginning symptoms. With these there is always associated a peculiar unstable nervous system. I want to put it this way. The ordinary toxins will lead to albuminuria and Bright's; the peculiar toxin here meant will lead to eclampsia. It may be that the suppressed menstruation retains some poisonous product. Here is an unknown poison that the liver cannot or does not destroy, and the kidney is inflamed by its excretion. The urine shows less urea and more uric acid, with leucin, tyrosin, and xanthin. Glycosuria, urobilinuria, indicanuria, and albuminuria seem a result of this toxic action. The nervous system suffers, as shown by irritability, fatigue, dizziness, headache, sight disturbance, pleuritis, salivation, constipation, and flatulence—a few of which are always present in every case.

The only sources of this poison are:—

1. Metabolism.
2. Alimentary canal absorption.
3. Bacterial action.

The treatment, then, demands, first, the keeping down of food to the lowest possible point, with rest in bed; second, active catharsis; and third, saline infusions and enemas, to dilute possible poisons. It will either rest at this or increase to eclampsia.

Retention of Urine.—This act is very complex, consisting of eight distinct acts:—

1. Accumulation of urine.
2. Rise of urinal pressure to 15 centimeters water.

3. Contraction of bladder.
4. Afferent influence from bladder to cord.
5. Efferent impulse to nerve raising pressure.
6. Relaxation of sphincter.
7. Emptying bladder.
8. Contraction of urethra emptying tube.

Now, interference with any of these will cause trouble, except the last. Retention may not exist, surely not until twelve hours post-partum, and then bruising of the bladder nerves may interfere with efferent or afferent impulses. Attention should be paid to persuading the woman to urinate, rather than to use the catheter too soon. This should be done in every and all cases yourself. I don't believe a nurse was ever trained to the point of using a catheter or giving hypodermics, and deplore this tendency. It must not be forgotten, also, that tight stitches in a lacerated perineum may so press on the nerve endings as to cause a retention.

A few cases have been reported of acute suppression of urine, and death. This is a very rare but hopeless condition.

POSTPARTUM HÆMORRHAGE.

Hæmorrhages from the womb during pregnancy via vaginæ are:—

(*a*) Menstruation (one).
(*b*) Abortion or miscarriage.
(*c*) Ectopic gestation.
(*d*) Separation of placenta.
(*e*) Placenta prævia.
(*f*) Rupture of womb.

During the first and second stages of labor:—

(*a*) Lacerations of cervix and perineum.
(*b*) Separation of placenta—short cord, placenta prævia.
(*c*) Rupture of womb.
(*d*) Uterine inertia and lack of contraction.
(*e*) Uterine inversion.
(*f*) Tumors and varicosities.

During the puerperium:—

(*a*) Emotion and shock relaxing contraction.
(*b*) Infectious diseases.
(*c*) Subinvolution.
(*d*) Sepsis.
(*e*) Postpartum hæmorrhage.

Postpartum hæmorrhage is a sudden, dangerous emergency that must be watched for. It occurs mildly once in 50 cases of labor; severe, once in 100; and fatal, once in 5000. Twenty-five per cent. occur before the third stage, 63 per cent. after, and 12 per cent. before and after the third.

The causes are:—

1. Above all, exhaustion of the womb muscle, its contractile force not equalling the blood-pressure from fright, shock, emotion, or inhibition of nerve force.

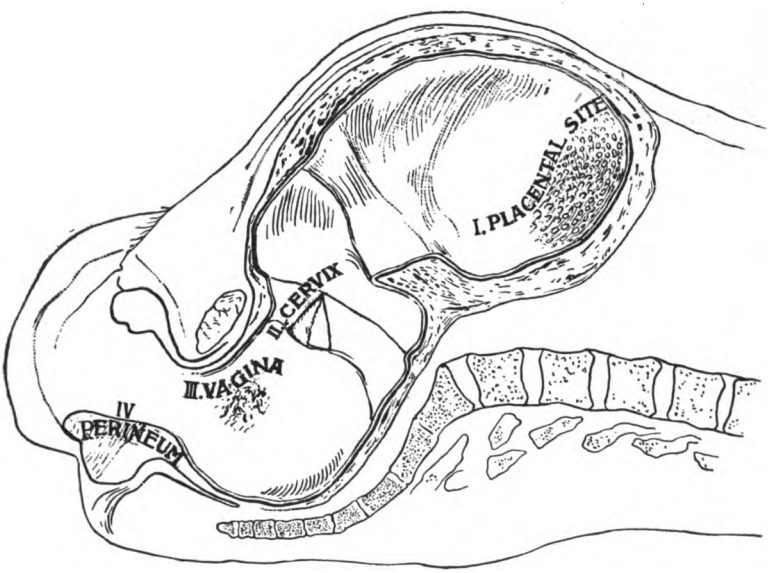


Fig. 64.—Sources of Blood from the Postpartum Vagina. (EDGAR.)

2. Too rapid emptying of the womb, before it can contract down firmly, especially if over-distended from

(*a*) Multiple pregnancy.
(*b*) Hydramnios.
(*c*) Forced labor, forceps, etc.
(*d*) Hydrocephalus.

3. Retained portions of placenta or secondary placentæ—especially frequent in miscarriage.

4. Lacerations of womb.

5. Short cord tearing out placenta.

6. Hæmophilia.

7. Infectious diseases, malaria, and albuminuria — especially syphilis.

That all women don't bleed to death is due to the peculiar anatomical structure of the vessels. At labor they are only an internal coat surrounded by long rows of muscle fibers, with some circular ones acting like a sphincter. It is the contraction of the womb that prevents the hæmorrhage. At labor, also, the blood is more coagulable and the current is slow. This slowness results in an extra number of white cells being present, and thrombosis quickly forms in the network of branching, irregular sini. It all sums up to a failure to secure, from nervous or mechanical reasons, the normal contraction. The hurry and rush incident to treating a hæmorrhage react on the woman, and her fright makes it worse from uterine inhibition. It is of interest to mention that those menstruating profusely often have this trouble at labor.

Prevention of this condition is more valuable than treatment. The woman must not be allowed to exhaust herself. In prolonged labors she should eat and be given sleep by morphine or chloral, or else the forceps used; and if they are used, the womb must not be emptied too soon. The same is true of enlarged pelvis (justo major), and in multiparæ, especially when lacerated. The head must be held back several pains to allow contraction. After the birth of the child the womb is to be held by the physician until the placenta comes and its perfect condition noted, and then massaged for one hour by a competent person to watch for any relaxation. Most cases that end fatally are the fault of the doctor in not being prepared. This is a good place to use the husband. If shown the rolling motion and told to feel the hard globular mass and notify you of a change, his services are very useful. A hard, firm womb is not a bleeding womb, and if blood be present it is from some other source. If there is hæmorrhage with a contracted womb there are probably some clots or placenta present. A trickling of bright blood indicates laceration. Postpartum is a large amount of clots and dark blood, with a soft, baggy womb. It is above the navel and feels like an ice-bag—lumpy and slushy. Pressure squeezes out blood from the vagina. Of the lacerations the perineum is in sight. The anterior vaginal wall bleeds worse than any other part. The laceration hæmorrhage comes on at birth, while postpartum is fifteen minutes or so later.

The woman must be watched. Often she will say nothing of flooding, thinking it to be normal, and perhaps not feeling it, even. The hæmorrhage may be open or concealed. If concealed, it is because

of a uterine atony and will not show externally until the womb is filled. She may complain of feeling faint and this remark should call for instant examination. She may bleed internally, with but little blood in sight, but with a large, soft womb, only to be followed by a half-gallon of clots in one gush. The hæmorrhage is like a cut femoral artery—in no other condition is there so much—and mere trickling from a laceration is not true postpartum hæmorrhage. See that her pulse is normal. She will not lose much blood before it changes. The prognosis of every case is doubtful.

Treatment. — Everything in the pharmacopœia has been tried and is a denominator of its usefulness. Ergot, strychnia, amyl nitrite, hand in womb, clearing out clots, ice, hot water, cold water, iron, lemon-juice, hitting belly, kneading womb, anteflexion, ligating extremities, transfusion, vinegar, injections, faradic current, gauze packs, chill to breasts, etc., are laid down in books and valueless absolutely at first; later some of them will be useful. Don't confuse yourself with such methods, but keep two facts before you. First, you must stop this bleeding, and then get contraction. There is but one way to stop hæmorrhage, and that is pressure. The best is pressure directly on the aorta through the abdomen. The bleeding can be controlled instantly. Another way is to press womb between hands, one behind, the other in front; this squeezes out clots. Or it may be anteflexed on and over the symphysis and there held by a band and compress for twelve hours. If aortic pressure is used and the bleeding once checked, it will not recur for twenty minutes, during which time you are to use the second step and get contraction.

Now, there are two methods of getting the womb to contract, namely: chemical and mechanical irritants. Both should be used. Ergot is to be given, at least two drachms, at once as soon as you can. Of all the chemical irritants, very hot water and acetic acid is the best and should be available. Nothing will do any good until the clots are removed or worked out, and hot acetic-acid water will do this and coagulate at the same time. It must be very hot and very strong—at least a 2-per-cent. solution. Theoretically, a faradic current would be good if available. Until the bleeding is checked even this is useless. I have had only grief from packs. Playfair says the womb will hold two ball dresses of gauze and still bleed, as it has the whole relaxed abdomen to dilate in. Anything put in will be washed out, and when the womb begins to contract it has first to expel the clots, gauze, or what not put in. A pain in the back is a good sign, as it marks contractions returning. As soon as the hæmorrhage is checked

and the womb coaxed to contraction, the woman will require treatment. Her head should be lowered and ergot, strychnia, and hot saline injections given. Most cases will require morphine, which seems to check hæmorrhage even. If much blood has been lost, bandage the limbs and give hypodermoclysis.

Now, the treatment of hæmorrhage from laceration, often called a postpartum, which it is not in the sense above spoken of, varies a little. In these cases you have a solid pelvis to pack against, and a tampon is of great value. You must make the diagnosis of the origin of the blood right in the beginning, which is very easy; for a solid womb is not a bleeding one, and the color and time of appearance will help in determining its source. There is nearly always some hæmorrhage, twenty ounces being considered the beginning of the pathological. If the hand has been massaging the womb by Credé's method and some competent person has held the fundus, the origin of any hæmorrhage is at once known, *i.e.*, from womb or canal. The placenta begins to separate as the child is born, but ought not to bleed until the after-pains start its expulsion. Cervical hæmorrhage can be controlled by pressing the womb firmly down into pelvis while the other hand forces up vulva with a pad. A "T" binder put on with a pad above womb and a vaginal tampon below, and the perineal straps drawn very tightly, will check it; or it may be sutured. Vaginal and perineal hæmorrhage can be checked best by gauze held by the finger firmly against the pelvis, and a pack put in around. Any packing must be cautiously removed in twelve hours and the rents stitched up. There is always great danger from sepsis in packing. The plan of Hermann, to stop postpartum by the hand in vagina and anteflexing the womb over it, is a good one. Lifting up the womb lengthens the arteries and compresses them and is a useful manœuvre, but they all take time and are not equal to aortic pressure.

Obstetrical nurses should be instructed to hold womb and squeeze it tight until the doctor gets there, in cases of this kind.

Secondary hæmorrhage is very rare, 1 in 1000 cases, and then only in the very weak and anæmic, and is due to retained clots or secundines. Secondary hæmorrhage in sepsis is not rare and should be watched for. It means a melting down of the thrombosis by the septic process and a reopening of the sini. Few cases will recover. To prevent any remote danger of secondary bleeding, a tight pad and binder should be worn for some days.

"Knowledge comes, but wisdom lingers." We know more to-day, but are not any wiser than our predecessors. We know more about

postpartum hæmorrhage than they, but our too varied knowledge confuses, and the rough and ready country doctor saved as great a percentage fifty years ago as we do to-day. Those old pioneers had a handy knowledge and a coolness in emergencies that we lack. His mind was free from details of asepsis and the dread of hurting the woman, and he very promptly did something and generally saved his patient.

INSANITY.

Puerperal insanity does not materially differ from other types, but has some peculiarities. It is divided into insanity of

1. Pregnancy, nine months, 22 per cent.
2. Puerperal period, to end of lochiæ, 46 per cent.
3. Lactation up to weaning, 32 per cent.

The majority show symptoms in the first week after labor, and 80 per cent. within two weeks. It occurs perhaps about once in 500 cases, more often in primiparæ. The reasons for the greater number of primiparæ are:—

1. Fear and lack of experience.
2. Greater influence of nutritive changes.
3. Mental shock of illegitimacy.

About 7½ per cent. of hospital cases have pregnancy as the cause. Now, from conception to end of lactation is about two years, and because a woman becomes insane during this time does not always mean her mental condition was the result of child-bearing. The causes peculiarly operating in a pregnant woman are:—

1. Hereditary neurosis.
2. Anxiety, disgrace, or desertion.
3. Exhaustion from hard, tedious labor.
4. Death of child, fright, etc.
5. Renal insufficiency.
6. Sepsis and especially mild cases with much extra excretion.

These are, roughly, added shock in one already predisposed. Every case is in a woman with hereditary tendency to it plus the physical strain of shock and sepsis, etc. The hysterical nervous system tends to disclose itself at puberty or early adult life, while insanity shows at maturity or maternal life. That maternity is but a promoting factor is shown by the little effect child-bearing has on one already demented.

The types seen are mania, 90 per cent.; melancholia, 10 per cent.; and dementia, rarely except as a terminal stage of the others. There is a rare type, spoken of in the novel "Adam Bede" (George

Eliot), of hysteric epilepsy, wild delirium, and unconsciousness, followed by hours of sleep and recovery, and in such cases the child is always destroyed.

The diagnosis is easy. The patient becomes excited or depressed. In the prodromal period the intellect is in abeyance rather than deranged, and may be scarcely disturbed. The disposition is changed, she is exalted, loquacious, excited, restless, or else silent, moody, dull, depressed. The mania is apt to become widely changeable—obscene, religious, destructive, or terrors in rapid alterations. In all forms there is persistent insomnia—a danger signal after labor—suppressed lochia and constipation. The extremities are cold and clammy, puffed and swollen, showing poor circulation. Milk is stopped, the tongue is coated and tremulous, the pupils often dilated. There are no marked facies, but there are always delusions of persecution and hallucinations, especially auditory. The melancholic type is especially religious and sacrificial or expiative. The onset of all forms is quite sudden; twenty-four hours may see the patient in well-defined mania.

But here is the important thing: no matter what the form, severity, or type, the child is in danger and should be at once removed entirely from the mother. They often have an aversion to the husband, but are sure to kill the baby as an opportunity occurs. As always, melancholia is more dangerous than mania, and more apt to have suicidal or homicidal tendencies—41 per cent. show this.

Naturally, all this is a great shock to the family, who rarely can be made to realize the danger and to whom the prognosis is of vital importance. More than 50 per cent. recover at home under proper care, though it is not so good in the unmarried. Most cases seem to have brown hair and brown or gray eyes. Very few have black hair and eyes, and none red hair. The usual age is from twenty-five to thirty, at the first pregnancy. Fully 50 per cent. have a family tendency, and the more remote the better the prognosis. Like all manias, the wilder and more violent, the sooner and more permanent the recovery. A pulse below 105 points to recovery, and it is especially favorable for a woman to begin to menstruate. When the alienation occurs in pregnancy, melancholia is more favorable; but in the puerperium, mania. According to Menzies:—

In pregnancy, 43.3 per cent. recover.

In puerperium, 75 per cent. recover.

In lactation, 56.5 per cent. recover.

Any case may pass through six stages, as follows:—

1. Prodromal.

2. Early delirium.
3. Melancholia.
4. Stupor.
5. Mania.
6. Dementia and death.

In the unmarried and during lactation the type is usually melancholia; also, lactation cases last longer and are more apt to become chronic. While recovery is the rule, it is a sad fact that they usually remember every act, obscene remark, gesture, and impulse. This is a source of grief for years, and may only pass slowly. This leaves the woman in a very unstable and pitiable condition, requiring tender care for a long period. And then in nearly every case recovery is only at a certain mental loss. They will not be quite the same, but some confusion and loss of memory can be noticed by their intimates.

As to treatment, I hesitate to step into the domain of specialism. Every case should have a competent alienist in consultation. The woman should not go to an asylum, when competent trained help can be had, for a month or six weeks. Save her this memory if you can. She should be put absolutely to bed and with necessary restraint, kindly done. Hypnotics should be given until she is quiet and sleeps. The regularity of food should be insured. Food must be rich and nutritious—milk and eggs largely. I deplore the tendency of some to abort the woman if the trouble occurs prior to labor. It is not a cure, nor does insanity influence the child. You must guard against retention of urine, and it is well to have the bed on the ground floor, for with the utmost care they may escape and throw themselves from the window; and again I caution you to not allow the baby in sight of the mother, and the husband only in rare cases. Each case must be studied and symptomatically treated.

DECIDUA MALIN.

When the placental *débris* or secundines remain in the womb, it will either spontaneously be exfoliated and eliminated or the mucous membrane will proliferate and become inflamed, forming a decidual endometritis. A decidual endometritis may be of two forms. In the first the placenta grafts itself on the membrane without change, namely, placenta sclera; or, second, it departs from its histology and becomes converted into tumorous masses. If this latter is benign, there occurs a proliferation of the placental villosities, normal in structure, or with a myxœdematous change, known as a mole. They are essentially benign, never returning after removal, and are never

metastatic. But this tumor, like any other, may be malignant. Now, the villi erode the uterine wall normally by a cytolytic action that is nicely adjusted. In a normal pregnancy the action goes just so far as is necessary to fasten the placenta securely. The cytolytic action is greater than the resistance of the uterine wall cells up to a certain point, when equilibrium is reëstablished, probably by some internal gland secretion, which allows the placenta to grow, remain six months, and then separate easily, or sooner if syphilis inhibits its action. At this time the uterine cells seem to have gained the mastery and are usually able to handle the remaining decidual cells. This nice adjustment may not be present; and if not, the retained mass, if fastened, is a malignant tumor with a true malignant history and histology of a sarcomatous type—chorio- or deciduo-cellular. There is certainly a relatively weakened uterine cell to the stronger decidual. This is on the outskirts of organic chemistry and the subject is not perfectly known. It is intensely malignant. The march is rapid to inevitable death; metastasis is very early and recurrence after removal sure. The benign mole is the same condition, remaining so and undergoing myxœdematous change; decidua malin is either a mole with a sarcomatous change or is so from the start. The stroma of the chorional villi are embryonal, like sarcomatous cells—the most rapidly fatal of all neoplasms. The first notice of this was by Meyer in 1878. In 1889 Sanger drew the distinction between it and other malignant sarcoma, from benign tumors, and in 1894 Beach, in a thesis, explained what it was and how caused.

The exact histology is obscure. It always follows a labor or abortion one month on an average, and consequently twenty-five to thirty-five years is the common period of life. Gottschalk considers a mole to be the first step, and that it is a malign neoplasm of the serolina reflexa set up by contact with the villosities. He thinks the placental villosities limit it, and around their points of attachment to the womb a proliferation of the last elements occur.

Hartman and Taupel think it a tumor originating in the chorion, *i.e.*, a chorio-sarcoma; LeCroix and Nové-Josserand, that it is from the cells of the womb; Sanger, a chorial serotinal sarcoma; Ruge, a neoplasm of the membrane lining the womb. These express two ideas of origin: first, that it is a sarcoma of the uterine mucosa following pregnancy; or, second, a sarcoma of the chorion resting on the epithelium of the villosities. In either case they agree that the placenta is not the starting point. It is, however, clinically a terribly malignant tumor of the body of the womb, ending in death by cachexia in six

to nine months. While it differs a little in clinical history, in general it is marked by violent and persistent hæmorrhages, often the first symptom noticed. This is profuse and exhausting from the first, following a poor involution of the womb. Pulmonary metastasis is very common. It is the most vascular of the known neoplasms, rapidly inducing anæmia. Cases have even bled to death from ulceration of the veins in the uterus. There are early loss of appetite, weakness, pain, and vomiting. The temperature varies; often it is subnormal, with chills and septic fever. The urine is albuminous, and the feet and ankles are œdematous. The womb remains large without involution, the os is patulous, and the cavity filled with a fungoid mass that bleeds easily. Palpation will show a point on the womb that is soft. Death occurs from hæmorrhage, sepsis, or cachexia, generally the last. The treatment is an early hysterectomy, which, unfortunately, only prolongs life. In the very beginning it might be mistaken for tuberculosis, until the hæmorrhage directs attention to the womb.

Sudden death in the puerperium is very rare. When it does occur it is most distressing. The scene of joy is turned to one of sorrow, and the physician suffers much in the loss of prestige. While nothing could have been done to prevent it, that fact is hard to explain, and it is well to have one's confréres called in to indorse the treatment and explain that fact to the family. The causes are accidental and postpartum hæmorrhages, uterine rupture, or thromboses of heart and lungs from air in the veins.

CHAPTER XVII.

PATHOLOGY OF LABOR—MATERNAL.

An absolutely normal labor is very rare. An abnormal labor is the rule, which becomes dystocia when outside help is needed and the child cannot be spontaneously born. A normal labor is one that occurs at the ninth month, in a woman free from organic and functional or febrile disease, with child in vertex presentation and born alive in twelve hours, with no instrumental or manual aid given, with the placenta detaching and delivering within thirty minutes without excessive hæmorrhage then or afterward, with no lacerations of cervix, vagina, or perineum, and with a mother healthy and well for thirty days and child ten days after delivery.

Some departure from this will occur in nearly every case. About one case in 200 is difficult and requires help; about one case in 1000 to 2500 must be helped or woman or baby or both would die. Nothing but the acumen gained by a long experience tells when and how to interfere in a labor. As a rule I believe more mistakes are errors of commission than omission. The operative work is decidedly a specialism.

They may be conveniently grouped under the following heads:—

A. Dystocia due to the maternal pelvis.
- Contractures.
- Exostoses.

B. Dystocia due to the soft parts.
- Rigid cervix or hymen.
- Unyielding perineum.
- Rupture of womb.
- Inversion of womb.
- Bandl's ring.
- Ventral fixation.

C. Dystocia due to the condition prior to labor.
- Diseases of organs.
  - Heart.
  - Lungs.
  - Kidneys.
- Eclampsia.
- Eruptive fevers.
- Insanity.
- Phthisis.

D. Dystocia from secundines.
- Amnion.
  - Hydramnios.
  - Dry labor.
- Placenta.
  - Detached.
  - Degeneration
- Cord.
  - Length.
  - Twisting.
  - Prolapse.
  - Amputation.

E. Dystocia due to the child.
- Presentations and positions.
- Dolichocephalic. I have seen one case.
- Twins.
- Size.
- Deformity.
  - Monsters.
  - Hydrocephalous.

Since normal labor also covers the first ten days postpartum, we must add to the above:—

F. Dystocia from maternal disease postpartum, which is particularly
- Sepsis.
- Insanity.
- Lacerations.

G. Dystocia due to the diseases of the child for ten days postpartum.
- Infections of eyes, cord, etc.
- Jaundice, etc.

DEFORMED PELVIS.

This may be defined as a pelvis in which one at least of the measurements is diminished to the point of producing abnormal mechanism in labor. Statistics of countries show great variations in kind and degree. For the United States, Edgar reports 1200 cases in which there were 30 generally contracted and 14 flattened, equivalent to 3.66 per cent. Of these 44 cases, only 13 required assistance.

Pelvimetry is a great help, but is not a sure guide to be implicitly trusted. It must be remembered also that contractions are relative as well as absolute, and if the head is of small size it will readily pass a considerable degree of absolute contraction. No ob-

stetrician would dare drift to labor without knowing that the pelvis was average and, as far as possible, knowing that the head was proportionate. It is to be remembered that there are large- and small-boned families; that intellectual people have large heads; that the baby will follow the husband's type of head, and, if it be large, the baby will probably be large also; that crossed race breeding tends to large offspring, and some families run to large children. Each case should be measured and a blank filled, not only for the record but for the systematic habits thus engendered. The general effects are various. The womb is retroverted and the head is high since it cannot settle, the womb lies more oblique, and abdomen is pendulous. There is pressure on bladder, and dysuria. When labor occurs the pains are irregular and inefficient from the distention, and the head only slowly engages. There is always great caput, while false presentations and prolapse of parts are common. The membrane ruptures early, and if descent is too slow or impossible the womb may rupture.

Deformity is found in proportion to the social status of the race. It is more common in the underfed, barely existing types of European peasantry. Its causes are:—

1. Defective development.
2. Disease of bones.
3. Irregular unions.
4. Disease of spine and limbs.

Deformities are reported as 5 to 16 per cent. in France, 2 to 8 per cent. in Austria, and 1 to 5 per cent. in Russia. In Glasgow 10 per cent. of hospital cases are flat and rickety.

A pelvis with 24 centimeters between crests should have:—

22.2 interspinous.
16.5 external conjugate.
9.5 internal conjugate.
11.1 transverse at brim.

When the interspinous equal the intercristus it is a rachitic pelvis, of which later. The most important measurement is the true conjugate, and but little variation is allowable here. When this is less than 9 centimeters (3½ inches) some operation is demanded other than forceps or version. When it is less than 5 centimeters (2 inches) the child cannot be delivered at all, no matter how crushed. There may be slight individual variations from this, but, as a rule, it is forceps for very slight defects, version down to 9 centimeters (3½ inches), or symphyseotomy or section down to 5 centimeters (2 inches), and section below. The head is capable of being squeezed 4

centimeters (1½ inches) anterior-posteriorly without increase of the biparietal. This is done by the frontal and parietal slipping past each other.

The pelvimeter will not tell very slight contractions nor indicate the operation to be required. In generally contracted pelvis of slight extent forceps are better than version, while in flat pelvis version is better than forceps; but version is limited to a flat pelvis not less than 8 centimeters (3 inches) anterior-posterior.

Cases of mild contractures at the inlet may be aided by a position called attention to by Dr. G. Walcher, of Stuttgart, and named after him. The woman is brought to the edge of a table or high bed in the lithotomy position, and then the legs allowed to hang down, extended. "When the legs are brought down the iliac spines describe part of a

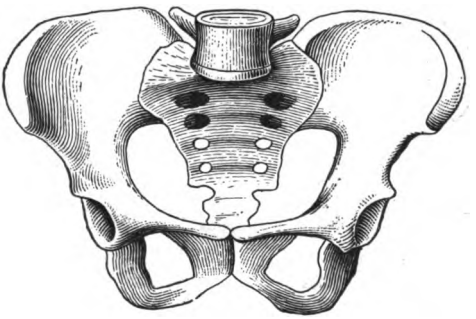


Fig. 65.—The Flat Non-rachitic Pelvis. (GRANDIN AND JARMAN.)

circle in a forward and downward direction. There is also an increased lordosis. There is also an increase of pelvic inclination, limited by the tension of the anterior longitudinal ligaments of the vertebræ and intervertebral discs. By this tension the sacrum is fixed. The anterior arch of the pelvis being drawn further down, the effect is not on the whole pelvis, but on the iliac bones at the sacrum. The transverse axis for this movement lies behind the second sacral segment. This axis being fixed and under the promontory, the symphysis must be moved further from the promontory as it nears the coccyx. The inlet is thus increased at the expense of the outlet. This action is limited by the sacro-iliac ligaments, the posterior ligament, and the psoas and abdominal muscles."

In difficult labors the woman may assume this position herself. In some Indian tribes the women will seize a rope tied to a limb and bend forward into this position. It should be assisted by a pressing

of the head into excavations, from above. The average gain will be about 4 millimeters.

The converse of this is true at the outlet, and a woman by squatting will enlarge the outlet. This position is often voluntarily assumed also, and was accomplished in the old obstetrical chairs of England used some centuries ago.

In foreign cities deformity is 2.8 to 22 per cent. of all cases. In 10,000 cases at the Sloane Maternity, New York, there were about 10 per cent. contracted, justo minor was over one-half, flat nearly one-third, and 66.3 per cent. terminated spontaneously. In the United States spinal and irregular types are very rare.

The general contracted type averages 2.5 per cent., and flat about 1 per cent.

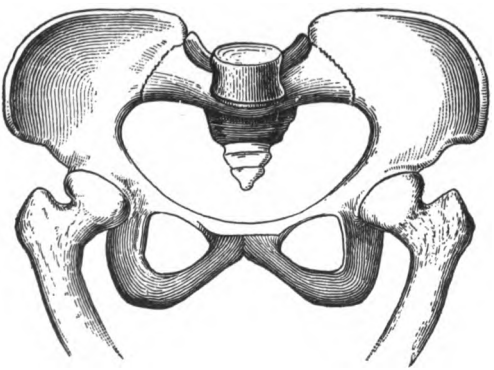


Fig. 66.—Flat Rachitic Pelvis. (GRANDIN AND JARMAN.)

The classification of Shauta leaves little to be desired and the types will be taken up in that order.

A. Anomalies the result of defective development.

1. Generally symmetrically contracted pelvis, not rachitic, namely, justo minor.
   - (*a*) infantile,
   - (*b*) dwarf,
   - (*c*) masculine.
2. Simple flat, non-rachitic.
3. Generally contracted, flat, non-rachitic.
4. Narrow, funnel-shaped—"fœtal pelvis."
5. Naegele pelvis—one sacral ala undeveloped.
6. Roberts—both sacral alæ undeveloped.
7. Justo major—equally enlarged.

8. Split pelvis.

B. Diseases of pelvic bones.

1. Rachitis.
2. Osteomalacia.
3. New growths.
4. Fractures.
5. Atrophy.

C. Junction of bones.

1. Synostosis at symphysis.
2. Synostosis at sacro-iliac.
3. Synostosis at sacro-coccyx.
4. Separation of pelvic joints.

D. Disease of spine or limbs.

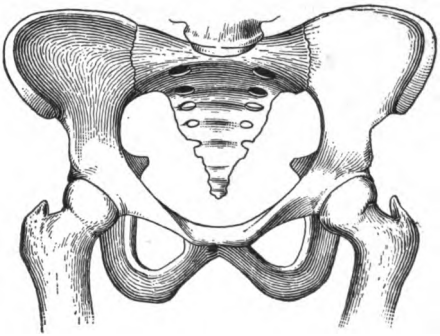


Fig. 67.—The Justo Minor Pelvis. (GRANDIN AND JARMAN.)

1. Spondylolisthesis.
2. Kyphosis.
3. Skoliosis.
4. Kyphq-skoliosis.
5. Assimilation.
6. Lordosis.

E.

1. Coxitis.
2. Luxation of one femur.
3. Luxation of both femurs.
4. Club foot.
5. Absence of one limb.

In general, a true conjugate of 8 to 10 centimeters calls for induction of labor; if it is below 7 centimeters, it is absolutely not to be attempted.

A-1. The infantile is a delicate-boned pelvis united by cartilage. The masculine is very strong and the dwarf is small. The dwarf type is the common one in American women. The woman is generally short and slender, her measurements are symmetrical but subnormal. In such, labors are slow from the start. The head is in normal flexion, and, but for disproportion of size, would be eutocia. Much moulding must occur, caput is present, and from the longer time required a breech is very fatal to the baby. Krönig (1901), in 222 cases of this kind (10-7.5 centimeters), only 9 per cent. required active help.

A-2. The simple flat is fairly common in the poorer classes.

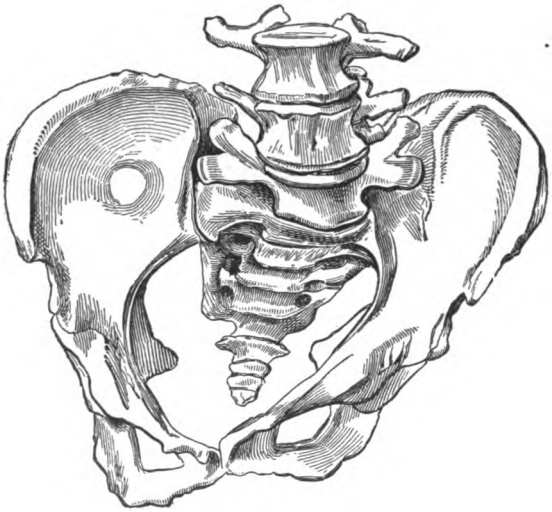


Fig. 68.—The Naegele Pelvis. Absence of One Sacral Ala. (GRANDIN AND JARMAN.)

Krönig (1901), in 504 cases flat (9.5-7 centimeters), only 9 per cent. required intervention; (8.5-7 centimeters) 16 per cent. required intervention in primiparæ; (9.5-8.5 centimeters) 2.7 per cent. required intervention.

In these 504 (*A*-2) and 222 (*A*-1) cases, or in 726 cases, in 91 per cent. labor was nearly normal, 44 children were lost. Of the 64 assisted, 25 were saved and 39 children lost.

The etiology is obscure. All measurements are normal but the true conjugate, which is less. The eye cannot detect this deformity and a double promontory is often present. A pendulous abdomen is a very frequent sign. When such cases come to labor there is lack

of flexion—a conservative process, to allow the biparietal to enter transversely. There is marked lateral flexion of head as the posterior parietal is caught on the promontory of the sacrum, and the sagittal suture is transverse. The symphysis being harder to pass than the promontory, it pivots on the latter. The anterior parietal bone then overlaps and the head moulds through. If the child can pass, it is best left alone unless lateral flexion becomes so extreme as to present an ear, when a version is indicated before the head slips up into a shoulder presentation. The womb should be supported by a binder. The first stage is slow because the head is late in engaging and the waters rupture early. Prolapse of cord or hand is frequent. The head may even show a groove from the pressure of the sacrum.

A-3. This is the union of the two preceding divisions in the same pelvis, which is both flat and contracted. The mechanism is that of

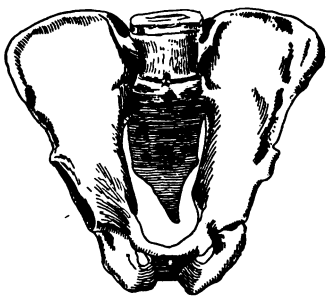


Fig. 69.—The Roberts Pelvis. Absence of Both Sacral Alæ. (GRANDIN AND JARMAN.)

A-2 (flat pelvis), when any is possible. At the very best, labor will be long and hard, more frequently impossible.

A-4. This is very rare and only seen in those who have never walked while the pelvis was developing and the upward pressure was absent. The true pelvis is long and narrow, the sacrum straight and far back. There is marked kyphosis. The maternal mortality is more than 50 per cent. and the treatment is section.

A-5. The Naegele pelvis is very rare and seen not once in a lifetime. One ala of the sacrum has never developed, either from:—

1. Absence of bone nuclei, or
2. Inflammatory change in same.

This last lacks proof, as no evidence of disease can be found and the condition has been noted in fœtal life. It is a congenital deformity in which the whole sacrum partially participates. The hollow

of the sacrum faces the atrophial side, the inlet is oval—the small end at the deformity. The symphysis is to the unaffected side, the crests are asymmetrical. The iliopectineal line on affected side is nearly straight, while the other side is more curved. Naturally the posterior spine is close to the back and the oblique diameters are unequal. There is but one-half the inlet for the child's head. Such women have no limp and may appear normal until stripped, when it can at once be noticed. Birth is impossible without section.

A-6. The Roberts, or atrophy of both alæ of sacrum, is so rare as to only have less than a dozen cases reported. Section is the only treatment.

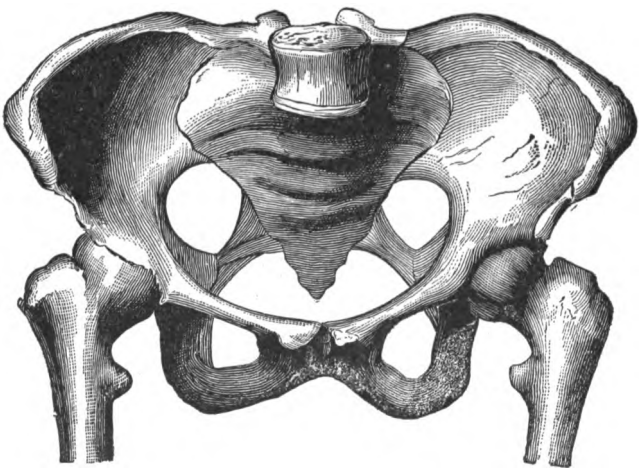


Fig. 70.—The Justo Major Pelvis. (GRANDIN AND JARMAN.)

A-7. Justo major, *i.e.*, large in all dimensions, may be met with even in small women. The womb is low and head well down in the last months. Pressure symptoms are early. Labor is easy and precipitate, and, but for the danger of lacerations and postpartum hæmorrhage from sudden emptying of womb, would not be an anomaly.

A-8. Nonunion here is very rare. It is not a complication of labor, which is normal.

B-1. The rachitic pelvis results from that disease in the fœtus. It has been described from very early times and in all races and conditions where the mother is poorly nourished. In the United States it is especially common in the colored race. The deformity is the result of bending of bones, cartilage, and periosteal tissue from the lack of calcification, and is fairly frequently seen. Such children walk

late or never, and are knock-kneed and "pigeon-breasted," often presenting tabes of skull, adenoids, and the "rosary." The pelvis has the following types:—

1. Flat, and all measurements short.
2. Generally contracted.
3. Flat-transverse normal.
4. Pseudo-osteomalacia.
5. Rare distortions.

The deformity is the result and can be accounted for by arrested development, pressure, and pull of the ligaments. A rachitic child

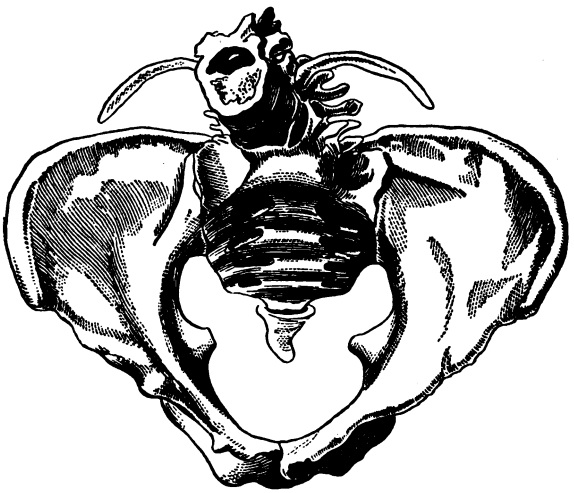


Fig. 71.—The Kyphotic Pelvis Showing the Lessened Transverse Measurement and Increased Conjugate. (GRANDIN AND JARMAN.)

is usually too young to walk, but not to sit. This force acts in the plane of the brim and forces the promontory forward, flattening the pelvis. In osteomalacosteon the reverse is true and the pelvis is narrowed. When a rachitic child walks, then a combination form will result—the osteomalacosteon or triradiate pelvis. In all cases of rachitis one side will be found more deformed than the other, which must be noted.

Such a pelvis is always small, often kidney-shaped, with a shallow cavity and a wide arch. The sacral promontory is projecting and marked, the bones fragile and small. Since these children walk late, the constant sitting presses up the tuberosities and the iliæ flare until the spines are wider than the crests. The sacrum tends to rotate, but

is held by the anterior ligament and bends, thus shortening the true conjugate. It often happens that the total area of the inlet is normal, but it is always distorted, while the true pelvis and outlet are always larger. The obstruction is therefore at the inlet and the pelvis always flattened. This deformity always shades from a slight contraction to absolute impossibility of labor; and its treatment, from forceps to section.

The always-present flattening forces the head to enter transversely, and in impossible cases will give Naegele's obliquity. There is great danger of the head becoming wedged fast, from premature efforts to rotate. The posterior parietal will show caput and grooving

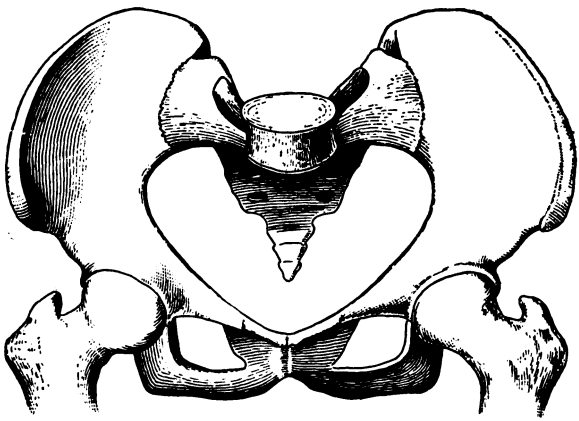


Fig. 72.—The Generally Contracted Flat Pelvis. A Result of Rachitis. (GRANDIN AND JARMAN.)

or spoon-shaped depression. In the light of the easily learned history, diagnosis is not difficult. The relative positions of spine and crest are peculiar to this deformity. The procedure to follow depends upon the room found upon close measurement.

B-2. Osteomalacia always leaves a Y-shaped pelvis. This disease is five times as frequent in females as males, but is very uncommon in the United States. Obstetrically, it is a disease of the puerperium, resulting in the absorption of lime salts and bending of bones under pressure. It is ushered in by rheumatoid pains, weakness, cough, dyspnœa, inability to walk, and a loss of height, which may be first noticed by the patient. It follows the birth of a child, and the deformity becomes worse and worse with every succeeding pregnancy until it is an absolute bar to delivery. The pubic arch suffers early,

followed by a forcing down of the sacrum. The pelvis will assume in time either an oblong, rostrated, oblong rostrated, or cordiform shape. The treatment depends upon the degree of deformity. Such women should be sterilized and aborted.

B-3. Exostoses are curiosities and the result of some injury usually, and may be of any shape or size.

B-4. Fractures of the pelvis are very rare, only four-fifths of 1 per cent. of all fractures.

B-5. Atrophy, caries, and necrosis are only met in childhood and leave variable results.

C-1. Syntosis of the symphysis is very rare and of no obstetrical interest.

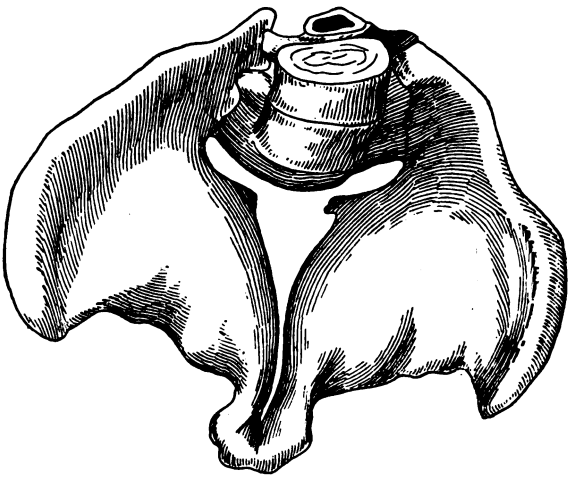


Fig. 73.—The Osteomalacic Pelvis. (GRANDIN AND JARMAN.)

C-2. Of the sacro-iliac joint, if occurring early, it would result in mild Naegele pelvis, but this is unknown.

C-3. At the coccyx it is quite the rule about the fortieth year and may require fracture, which, if not spontaneous, could be easily done. The woman should be placed on a ring; and in the few cases in which it was done, it did not complicate delivery or the puerperium.

C-4. Abnormal motion would only be an exaggeration of what normally occurs.

D-1. From the frequency of spinal disease, this is a most important subject. Spondylolisthesis, first described by Killian, is a settling down of the lumbar spine into the pelvic region. The third and

fourth lumbar segments especially settle, while the sacrum is pushed down and back. There is marked lordosis and elevation of the pelvis in front to compensate for this. The vulva is raised and is vertical. The cause is not known. The pelvis loses its inclination, and there results great strain on the ilio-femoral ligaments. The ischial tuberosities come close together, while the crests flare out. The shortening in the back brings the ribs and crests close together. The woman steps short and to the front. Actually, the transverse at the outlet is greater and the inlet shorter than normal. There is often a history of a fall or injury to the back. The womb is high and pendulous.

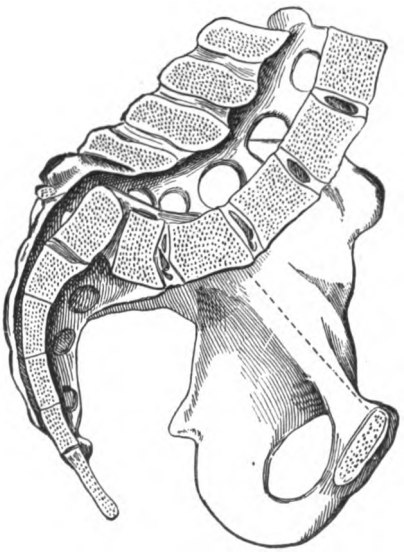


Fig. 74.—Section of a Spondylolisthetic Pelvis. (GRANDIN AND JARMAN.)

The diagnosis is easy. Delivery is usually impossible, but only after the head perhaps has engaged.

D-2. Kyphosis is the result of Pott's disease of the spine and results in many kinds of deformity. The lower the disease, the worse obstetrically. The sacrum is pushed down and backward, and usually in rotation, to compensate. There is less inclination to the pelvis than normal. There is a history of tuberculosis. The contraction is mainly at the outlet, and labor progresses to that point and stops. Transverse presentations are common, and two-thirds of the women die. Unless the dimensions are ample, section is the preferable procedure.

D-3. Scoliosis, *i.e.*, lateral deformity, is rare and results in an asymmetrical pelvis in the effort to compensate.

D-4. Kypho-scoliosis is the union of the last two preceding.

D-5. Assimilation or blending of sacrum and coccyx is very rare.

D-6. Lordosis of pelvis only has but a few examples.

In general, every spinal curve will have a compensation somewhere, usually taken up in the pelvis and affecting the opposite side. Be exceedingly suspicious of every case when the spinal line is not median, vertical, and untwisted.

E-1. Coxitis—hip-joint disease—is very common and leaves an oblique deformity. The earlier it begins and the more walking done, the more deformity. There are two types. First, the well innominate is pushed upward, inward, and backward, and is contracted, while the affected side, from lack of weight in walking, remains infantile and undeveloped.

Second, the deformity is on the affected side, which is forced in from arrested growth, with atrophy of the alæ and anchylosis of the ilio-sacral joint. These patients limp badly, one hip is immovable, and the pelvis is rotated and asymmetrical.

E-2. Congenital luxation does not, as a rule, seriously alter the pelvis. The same applies to club-foot (*E*-4.).

E-5. Absence of a leg will not usually deform the pelvis, but if, for any reason, there is no walking, the pressure of sitting will bring the crests close together, widen the tuberosities, and rotate the innominates toward each other.

In all cases of deformity, have exact measurements taken early and a consultant called. Such women should never marry; for these unfortunates maternity should not be. If they are pregnant, however, it is often a problem just what to do. It seems to me that a section is preferable to repeated abortions, followed by sterilization if the woman will permit it. The surgical skill of the attendant, modified by local custom, circumstances, and religious prejudices, must enter into the problem, which fortunately rarely comes to any one not a specialist in obstetrics.

Dr. J. Whitridge Williams has lately been investigating the cause of a peculiarity in connection with funnel-shaped pelvis. Deformity is much more frequent in black than in white women, the negro being a degenerate; but funnel pelvis is equal in both, and therefore, would seem to require some factor other than degeneracy. In four cases of his 56 deformities in a series of 700 deliveries, he was able to demonstrate a sixth segment in the sacrum. The possibility of proof was

wanting in others where the condition was strongly suspected. This added length of the sacrum tilts the inlet and makes a very much sharper angle at the promontory—almost a kyphosis—and by throwing the weight of the body on the ischii they are forced together and the outlet narrowed. These observations have not been published, and I mention them by the courtesy of Dr. Williams.

CHAPTER XVIII.

PATHOLOGY OF LABOR—FŒTAL.

DYSTOCIA FROM MATERNAL SOFT PARTS.

A RIGID, unyielding cervix may be the result of

1. Scars from previous traumatism.
2. Lack of efficient pains.
3. A true spasm of the muscle; or possibly
4. A disproportion between the strength of the upper and lower segments of the womb.

It may require dilatation by fingers, Barnes's or Voorhees's bags, colpeuryntur or incision. The bags are the nearest approach to natural methods. Dilatation by the fingers (Harris' method) is very fatiguing, but gives the best control of the cervix. One finger is introduced, then first finger and thumb, then the second, and so on. A method recently described by Edgar uses the first finger of each hand and is more rapid but also more dangerous. A rupture is easily done, especially in the presence of scar tissue and old lacerations, and is apt to be wide. At times one can actually hear the fibers snap before laceration, and this is a signal to stop at once.

Dührssen uses incisions to the four cardinal points, which must not extend to the circular artery, and require after-treatment.

In general, time and patience will overcome most cases. Applications of cocaine and belladonna have not succeeded well in my hands, but a steady stream of hot water applied against the cervix has been efficient in many cases, both in softening the cervix and increasing uterine action.

Dystocia from fibroid tumors may cause little trouble or a great deal. It is a question of their size and probable growth. If at the fundus and beyond the dilating zone, they will cause little trouble at labor. Pregnancy does not increase their growth to the extent that would be expected. Any fibroid, however, is liable to slough and cause sepsis. If they are small, they may be removed by operation.

Any abdominal organ or its contents may complicate labor. Pus tubes will not raise up with the womb and should be promptly operated upon.

Malignant tumors of the womb will require abortion at once, and it is well in malignancy of other organs also to terminate pregnancy.

DYSTOCIA OF FŒTAL ORIGIN.

Faulty attitude is any change in the ovoid, which is normally one of complete flexion, and just so far as it departs from it may give rise to degrees of dystocia. It gives a changed presentation from the normal L.O.A. In connection with this must be grouped excessive flexion, or Roederer's obliquity, in which the head is in such exaggerated flexion that the occiput enters perpendicularly, or the neck is practically the presenting part. It is caused by a rigid os or vagina in generally contracted pelvis, or a very large head with forcible pains. It is some obstruction in front and the head is overflexed and mould-

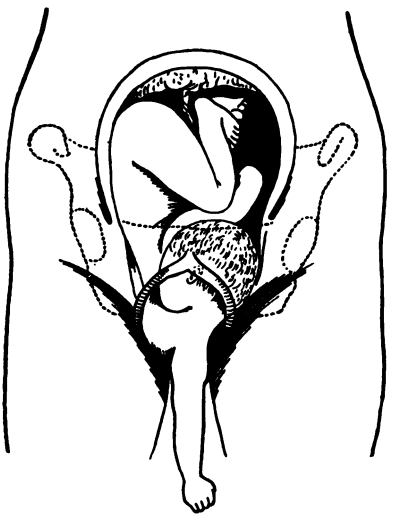


Fig. 75.—Position of Fœtus in Impacted Shoulder. (GRANDIN AND JARMAN.)

ing takes place at the occipital and parietal bones. It delays labor, but of itself is not a true dystocia, but the result of what is a dystocia already.

A bregma presenting is a mild dystocia, the result of slight extension. Both fontanelles are on the same plane, the occipito-frontal circumference, 34 centimeters (13½ inches), instead of the occipito-bregmatic of 28 centimeters (11 inches), is at the superior strait, and a long and tedious labor results.

In still greater extension the brow presents, which is only ¼ of 1 per cent. of cephalic cases, much rarer than the face. The tendency for the brow is to either flex normally or extend further into a face

presentation because of the inequality in the arms of the lever. We have:—

Fronto-læva anterior—L.F.A.
Fronto-dextra anterior—R.F.A.
Fronto-dextra posterior—R. F. P.
Fronto-læva posterior—L.F.P.

Of these, the left anterior and posterior are the most common. With plenty of relative room it may not impede labor, but, as a rule, moulding is slow (twenty-four to thirty-six hours), a caput forms

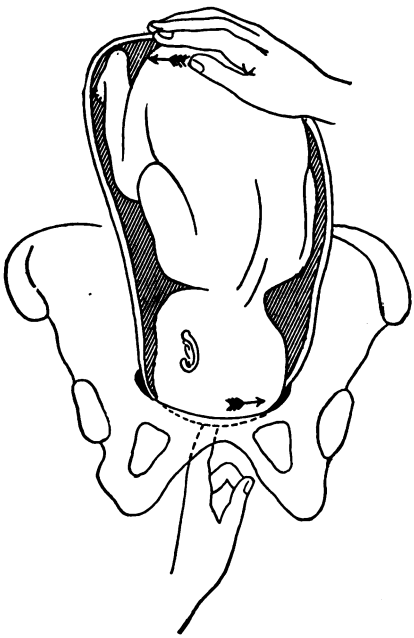


Fig. 76.—Direction of Force in the First Step of a Bi-polar Version. (GRANDIN AND JARMAN.)

over the nose and anterior fontanelle, and the head is moulded into a triangular shape. A manual correction of bregma, brow or face presentation is occasionally successful. Schatz's method is the modern one. Correction can only be done when recognized early, with unruptured membranes, a movable head, and plenty of time. The breech is pushed up externally and toward the ventral side by a helper. One hand of the operator pushes the sternum in the opposite direction, while the other hand internally works the head into flexion. The

external hands must push upward. The moulding lessens the occipito-mental diameter and increases the occipito-frontal, while the parietal slopes downward and backward.

The labor is very painful and the brow is deep into the pelvis in engagement. Inertia may come on, and labor often stops with the head still under the pubes. The head may attempt to rotate with the occiput forward, and if so it will become transverse and there stop. The shoulders are in the pelvis before the head is born, which takes place by flexion, the forehead appearing at the vulva and the cranial wall sweeping over the perineum when the face is under the symphysis. As in occipito-posterior and mento-posterior, the brow may stop at the inlet. Every case has in it the element of a chin posterior. It is hard to diagnose by palpation externally. Maternal mortality is given at 10 per cent.; fœtal, 30 per cent. The dangers are from exhaustion, shock, laceration, and sepsis. The child suffers from the compression and moulding, the face is badly disfigured, and prolapse of the cord is very common. At any time before engagement the brow may become a vertex.

The axis of traction cannot be put on far enough posteriorly for forceps to assist in flexion, and they are worse than useless. Efforts for pressing back the chin with fingers in the mouth are rarely successful, and the best procedure is version before engagement. When once the head is engaged there is nothing that can be done but to wait until the head is down. Every centimeter of advance helps to reach a point where forceps can be of assistance. Of course, if the child should die perforation is indicated. It is the most unfavorable of all head presentations.

The transverse position of the head is the result of contraction of the anterior-posterior diameter alone. No matter how the head is flexed, the biparietal diameter is held while the smaller bitemporal will tend to pass. By moulding only can the biparietals pass into the excavation with the head in the transverse diameter. Here one of two things will happen: either the head again flexes, or it will remain extended as a bregma. The mechanism is the same as a vertex, except that rotation is interfered with, because when the biparietal has passed the bitemporal has reached the floor of the pelvis. If the forces are equal, namely, the forward thrust of the perineum and the long arm, then it will remain a bregma. With a more rigid floor the uterine force will flex the head in the excavation and it is rotated and delivered as an L.O.A., which in reality it is. Moulding and engagement are slow, rotation often fails, and labor may terminate with the head

transverse in the pelvis from lack of force to rotate the head. The perineum is always torn and the vagina greatly stretched when flexion has not been accomplished. The diagnosis is easy from the low anterior fontanelle, as well as the transverse position. The treatment is to hold back the forehead, and later the application of forceps to aid the pains and thereby assist rotation.

A face presentation is a cephalic in extreme extension, occurring once in about five hundred pregnancies. The chin is the lowest and presenting part. The extension is not the result of any contraction or obstruction, but seems to be a peculiarity of the child, a poorly-shaped head, goiter or cord around the neck, or some mechanical cause

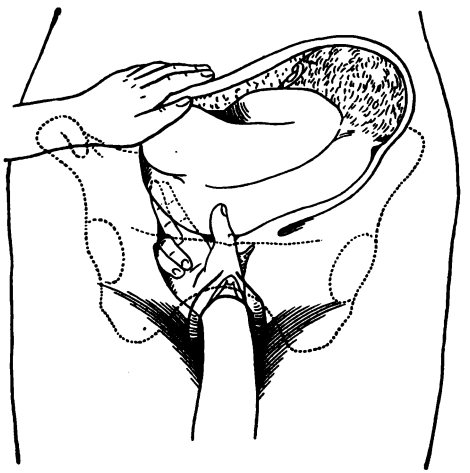


Fig. 77.—The Grasp of the Knee in Version. (GRANDIN AND JARMAN.)

which prevents the normal flexion by lever action. That it was the result of lateral deviation of the womb and a triangular shaped head has been advanced, but without foundation. We have:—

Left mento-anterior—L.M.A.
Right mento-anterior—R.M.A.
Right mento-posterior—R.M.P.
Left mento-posterior—L.M.P.

Moulding is slow and mainly of the occipital region. Engagement is imperfect, and an effort should be made before this to flex the head. The mortality to the mother is 1 to 5 per cent.; 15 per cent. to the child. There is also a tendency for non-flexion of the arms, and if they get behind the neck a very serious condition is present, which will be spoken of later.

In L.M.A. the mechanism is practically the same as L.O.A., except that the force is at a disadvantage for the following reasons:—

1. The womb is not contracting in the axis of the presenting part through the vertebra, but at an angle, and is less efficient.

2. The cervical vertebræ are at an angle with the spine and the head is dragged along, not pushed from behind. There are retardation by the friction and danger to the neck.

3. The anterior rotation of the chin is slow because it is softer

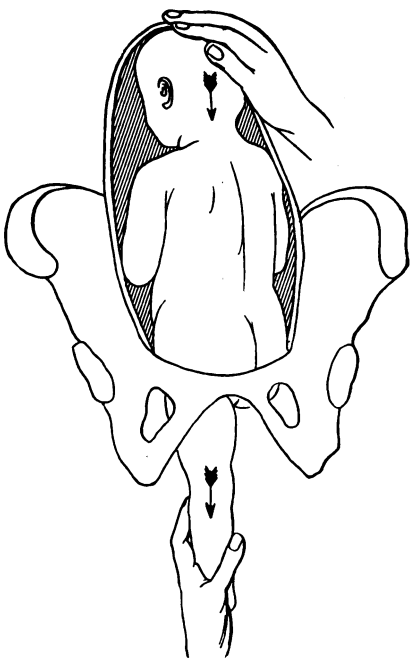


Fig. 78.—Last Step of Version—the Bringing Down of One Leg until the Knee Appears at the Vulva. (GRANDIN AND JARMAN.)

than the vertex, made all the worse by the œdema present. When the chin is on the pelvic floor the force is not expended in rotation as in a vertex, but must also be used to extend the neck. There are two things to be done with the same force.

Moulding is slow, because the face and base are rigid and only the forehead can yield. In a vertex, on the other hand, the whole vault can be modified. The result is a flattened head with a long cervico-bregmatic diameter and a caput on the dependent cheek, whose size is determined by the duration of labor. The neck is in its greatest

possible extension until the chin is on the floor, when the head is born by flexion. The R.M.A. is identical, except that movements are reversed.

All permanent mento-posterior positions are practically impossible of delivery, and every face has the danger in it of becoming a mento-posterior if engagement is delayed. The neck is so short that the chin cannot reach the floor before the thorax enters. That is, it cannot rotate anterior as does the occiput in posterior positions. From chin to sternum is 9 centimeters which can be forced to 10 centimeters. But when the chin is on the floor the uterine action will tend to extend

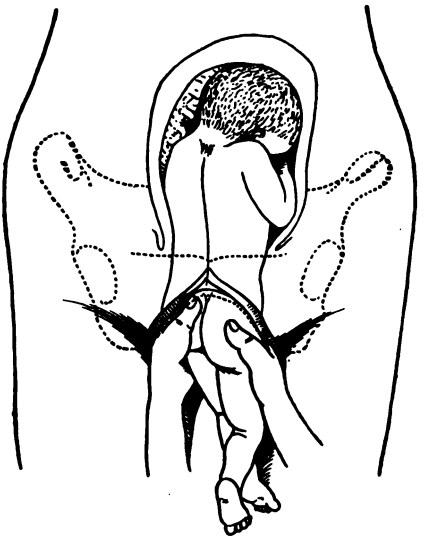


Fig. 79.—The Correct Grasp of the Fœtus in Breech Extraction. (GRANDIN AND JARMAN.)

it further, not to flex it, for the force through the neck and inferior maxillary is nearly in a straight line. In a very, very few cases the chin has reached the coccyx, the face looking directly down on the perineum, which has been forced down and lacerated as the head was born in flexion. An effort should be made to convert them into a mento-anterior by the Schatz method or that of Baudelocque, which is as follows: The operator, standing on the side of the fœtal occiput, passes the hand corresponding to the face of the child to the upper jaw or, grasping the whole face, forces it away from the superior strait in the direction of the chin, while at the same time the external hand presses the occiput down. Under no circumstances

should the forceps ever be put on a chin posterior. The usual result is for the chin to engage and descend, and before the chin can be born the shoulders have entered the excavation with the occiput. With every pain thereafter the child is but the more firmly locked. And while in rare instances birth at the expense of the perineum has been accomplished, the old rule, that the chin must be front, holds good.

While face presentations are safer than brow when the chin is anterior, they are long and dangerous, and are rarely diagnosed by external palpation. They tend to correct themselves oftener than brow, but the face is a poorer dilator of the cervix. Attempts to cor-

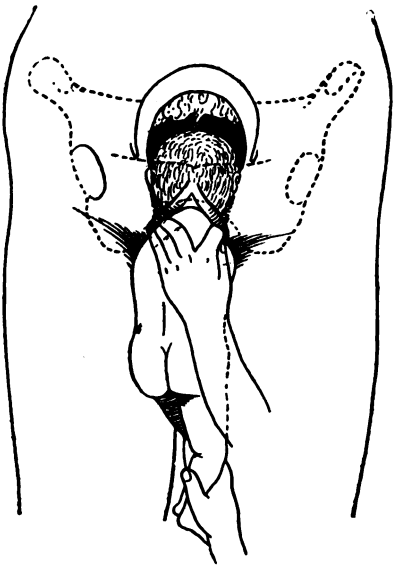


Fig. 80.—Extraction of the Head. (GRANDIN AND JARMAN.)

rect a face presentation must be carefully done, lest by some accident it become a chin posterior, or if not completely done it may become a brow.

Naegele's is a lateral flexion of the head. In normal cases the anterior parietal is lower, from the obliquity of the inlet. An exaggeration of this until the ear presents is Naegele's oblique presentation. It can only be told on internal examination. Its cause is a flat or general contraction, pendulous abdomen perhaps, and obstruction.

The reverse, where the posterior parietal is lower, is Litzmann's obliquity, a sign of marked flattening in the pelvis. The tendency is

to spontaneous correction if the obstruction can be passed, and upon the amount of this depends the prognosis. No efforts at correction can do any good. It is the natural and only way in which the head can engage, and should be given a trial.

Prolapse of an arm is a positive help in breech cases, but a dystocia in cephalic. If before rupture, it will usually slip back when this occurs and the head engages. If the arm is extended, it usually has the cord with it. The head and arm cannot engage together. The head will usually slide up into the iliac fossa and the shoulder descend. The hand is usually also on the bitemporal diameter. It is caused by improper engagement, often contraction: shoulder, face, or brow presentations, twins, sudden ruptures or hydramnios, and relaxed womb. The sudden rush of water washes it down before the head engages. In shoulder and breech, apply a fillet. It assists in diagnosis and may be a gain. In cephalic, the arm can be replaced at times, but in most cases a version is preferable.

The dorsal displacement of arm, *i.e.*, behind neck, is always very bad. It is a ridge on the ellipse, always catching and impossible to bring down by any manœuvre that is worthy of the effort. A version is indicated. In breech cases the arms can be swept down easily, of course from back to front lest the shoulder be injured.

BREECH PRESENTATIONS.

In 1 per cent. of the breech cases the legs will be extended at the hips. It is not dangerous, but breech and feet dilate better than the living wedge. Hand and foot together are curiosities and will correct themselves. In every case of a prolapsed extremity the fillet should be put on, for need of it in traction may occur.

Breech cases are dystocia in their departure from the normal vertex and possibility of accidents. Theoretically, either end of the ovoid might be born equally well. They are named from the sacrum. A frank breech is one with the legs extended. This extension may be primary if before labor, or secondary if it happens at labor. Extension during labor is the more common, especially in primiparæ.

Left sacro-anterior—L.S.A.
Right sacro-anterior—R.S.A.
Right sacro-posterior—R.S.P.
Left sacro-posterior—L.S.P.

In simple breech the hip is flexed and knee extended. The mixed breech, with hip, knee, and ankles flexed, is practically a normal labor. About one case in thirty-two is a breech. The cause is operative after

the thirty-second week and is some cause that prevents the sinking of the head. Relaxed womb and walls, hydramnios, contractions, and fibroids are given, but the real cause is not well understood. The L.S.A. is the same mechanism as the vertex, but the breech is a poor dilator and the first stage is slow. The baby is greatly curved when at the outlet, lying in a letter "S," and the buttock is very prominent. Mixed breech is more favorable than simple or frank breech; but if simple, the legs should be left extended. Usually the arms are across the breast. If extended, they must be brought down before the head engages. The uterine action always flexes the head, which is at right angles to position of the sacrum. The head rarely fails to rotate ante-

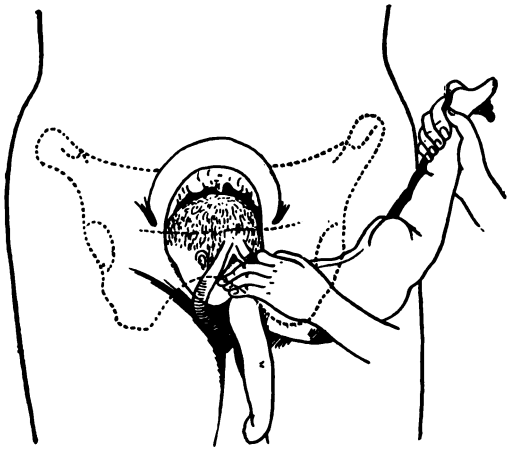


Fig. 81.—The Raising of the Body to Sweep the Face Over the Perineum. (GRANDIN AND JARMAN.)

riorly in every position—the trunk and neck offering no resistance, rotating all that is needed. The neck is applied under the symphysis and the face sweeps over the perineum in flexion. Very rarely—2 per cent. of breech—the head fails to rotate to the front, when one of two things results: first, the forehead is forced against the arch, and with the pressure at the nucha the head is born in flexion, chin, mouth, and nose coming under pubes; or, second, the head is extended, the chin is held under the symphysis, while the occiput sweeps over the perineum, occiput, bregma, and forehead coming in turn.

The prognosis in breech cases is, in general, good to the mother. Laceration is a little more frequent, for the reason that we cannot retard until softening occurs. It is imperative to deliver the head

within a few minutes, since the cord is always pressed upon when the head engages. This is the cause of the 20 per cent. mortality to the infants. When once the head is engaged, it must be rapidly delivered. Asphyxiation is the great danger. Only five to ten minutes are required to render the child past resuscitating. Efforts to breathe with face in vagina, filling mouth and lungs with blood and amnia, will shorten the time in which it can be saved. Again, the placenta is very often disturbed partially or in whole when the body is born, and the baby may actually bleed to death. When the feet and breech are together their dilating surface is equal to the head; but when the feet alone—the tip of a wedge—come first, trouble is the rule. The firm, round head is the best dilator and the soft breech the best cushion for the womb to act on. The womb may inhibit its action on the hard head, and the pain may make it impossible for the woman to bear down. Again, the round head is a ball valve to the cervix and retains the liquor behind it, while the irregularities of the breech admit of the escape of most of the liquor and it is essentially a dry labor.

The diagnosis, both internally and externally, is easy. In the first stage the membranes project more conically, like the "finger of a glove," the smooth oval of the vertex is replaced by irregularities of the hips, and early rupture is the rule. Face and breech may be confusing to the touch. The mouth is loose and has the gums, while the sphincter is soft and contracted and meconium coats the finger. The mouth is prominent, the anus depressed; foot and hand differ in thumb and toe, the thumb points to the body; knee and elbow differ in the patella. Before labor, spontaneous version may occur.

The real danger begins with the second stage, when the umbilicus enters the pelvis, and is at a maximum when the head engages. The waters should be saved, if possible, by rest and quietness. The suggestion to assist dilatation of vagina and perineum by tampons or bags is good only in theory. As the body emerges, draw down the cord and follow down the head with one hand on fundus.

In every breech case have your forceps at hand and ready for instant application, and be prepared to resuscitate a cyanosed baby. The following down of the head by the hand engages it early, and prevents the extending of one or both arms along the head and the loss of many precious moments in getting them down. The heart-beats of the child should be noticed; their failure is a danger signal. If you will pull down the cord when the navel is born, you will know it is loose and not short enough to invert the womb, and push it to one

oblique diameter. Now, a great source of danger is the premature efforts of the child to breathe. Respiration is largely started by the shock of cold air, and in every case you are to wrap the child in hot towels as it emerges, to prevent this until the head is out. Also you must support the body, to prevent strain on the neck, and raise it in the curve of Carus. Hold your woman from bearing down until the engagement of the head, and then have her put forth every effort. Never endeavor to alter position of head by twisting the trunk—you can't do it, but you can wring the child's neck and waste time. Pressure from above will force the head out; and if not, use your forceps. They are more easily applied than in vertex. Under no circumstances pull on a leg.

SHOULDER PRESENTATIONS.

Shoulder presentation is never exactly transverse. Even if so before labor, the first pains would make the child lie obliquely. It is also always anterior, the belly of the child conforming to the mother's spine. The child lying crossways, the shoulder is at the os uteri, because it is the dependent and most solid part of the baby. They occur about once in one hundred and twenty-five to three hundred births, and are a perverted L.O.A usually. Birth in that position is impossible. In a primipara it means a contracture as a rule. Monstrosities, hydramnios, twins, lax walls and womb, placenta prævia, and tumors have been considered causes. It is seven times as frequent in multiparæ as in primiparæ. There is no mechanism. It is named, to conform to the other positions:—

Left scapula anterior.
Right scapula anterior.
Right scapula posterior.
Left scapula posterior.

During labor it may spontaneously change in three ways and be born, none of which should be waited for nor expected:—

1. Spontaneous version.
2. Spontaneous evolution.
3. Doubled fœtus.

In the first the ovoid orients itself to a cephalic or breech before labor, very rarely at labor. If it happens at all, the os must be rigid, contractions strong, amnia ample, and the child small. After rupture of the membranes it could not possibly happen.

Second, the shoulder may be forced down and rotate forward under the symphysis, the head and feet lying together. Then the other shoulder and the buttocks may follow, then the feet, and lastly

the head. This is thought to occur in 8 per cent. of the cases. The steps of the mechanism would be:—

Compression of child.
Descent.
Engagement of anterior shoulder.
Descent of the back and posterior parts.
Posterior shoulder and arm born.
Delivery of the head.

The body and spine would be greatly twisted and the child very likely impacted. It could only occur with a small child and a roomy pelvis.

Third, in a premature, macerated, and dead child, the head and pelvis may pass at once, but this can never be the mechanism at term. These three events are curiosities only.

Every shoulder case, if unaided, is a fatal dystocia. Labor may drag on for days, until the mother is exhausted or the womb ruptures, which will surely happen if strong pains continue. Version is the treatment in every case except where the shoulder is engaged past pushing back or the ring of Bandl is formed, when section is demanded. The condition is diagnosed easily and presents no difficulties.

DYSTOCIA DUE TO THE FŒTUS.

1. Monsters of all kinds.

2. Twins and triplets may be as easy and normal as single births, but have always the possibility of dystocia. Brow and face, *i.e.*, non-flexion, is more apt to occur in multiple births, besides the dangers of interlocking or premature descent of some part of the second child. Postpartum hæmorrhage from the previous distention is a not-to-be-ignored danger.

Twins occur about 1 in 89 labors, and triplets in about 7921, *i.e.*, the square of 89. By analogy, quadruplets should be the third power and quintriplets the fourth power of 89.

In cases of contracted pelvis twins may tend, by their smaller size, actually to eutocia. In multiple births, should any other part present than head or breech, podalic version is indicated, nor should a longer interval than one hour intervene between deliveries. Cases have been known of weeks intervening, especially in superfœtation.

In triplets the labor is long. Each sack usually ruptures and placenta is delivered before the next child. Uterine inertia comes on before the last child, and hæmorrhage is common. It is rare for all to live. One-third of the last born are dead.

Multiple presentation is where parts of two children present at once. One must be pushed back promptly before they lock fast. Should two amnion sacks present, wait for full dilatation and rupture, or, better still, rupture the more prominent and engage that fœtus, pushing back the smaller. As a rare condition, the pregnancy may be prolonged over 280 days and the head becomes hard.

An extra large child is a cause of dystocia. In general, all of ten pounds or over are such. Much depends on relative size, moulding, etc. The causes of large children are:—

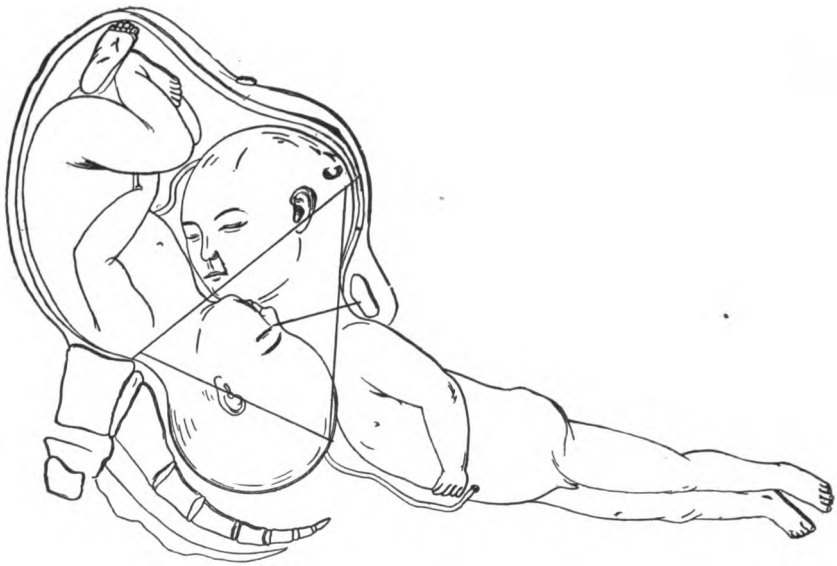


Fig. 82.—The Most Common Position of "Locked Twins." (GRANDIN AND JARMAN.)

1. Children of one or both giant parents.
2. Prolonged gestation.
3. Size of father's head—a fair rule-of-thumb for the baby's.
4. Mixed nationalities—the added vigor of cross-breeding seems to especially favor large heads.

For these conditions, if recognized in time, a premature labor at eighth month is demanded.

Hydrocephalus is properly a monstrosity and a very dangerous matter. It can readily be mistaken for a breech. Few labors end spontaneously, 25 per cent. of the mothers die, and many children—it would be better if all died. "For it is not the mother whose child is dead for whom we should feel the deepest sympathy, but rather for

her who lives in the valley of sorrow, and who never can bury the dead out of sight, nor know true peace until her boy has passed to that far country where dreams come true, where griefs are changed to joys and hopes to realities." Such children are, of necessity, mentally deficient and rarely live. In such a case it is best to puncture the head. This is not usually a fatal procedure to the child, it will be born alive—a gain by no means to be ignored—but will end in its early death after some moments of living. It is always a black eye to have a dead baby born, from a professional standpoint; and to many parents the gain of a living child that can be baptized is not to be lost sight of. In every case avoid forceps, and especially avoid version.

Rigor mortis in utero of a dead child and resulting dystocia is a curiosity merely.

PROLAPSE OF THE CORD.

Prolapse of the cord is an accident of the second stage. Before rupture it may be often felt through the membranes, and is carried down by the rush of amnion in an oblique diameter. It occurs about 1 in 100 labors. Its cause is:—

1. Sudden rush of amnion and hydramnios.
2. Long cord.
3. Small fœtus, premature labor, or breech which does not fill the inlet.

The condition kills one-half the infants by asphyxiation. If the cord pulsates, the child is still alive. It should be prevented by having the woman on her back when the waters break, and allowing them to leak, not rupture. If it is felt beforehand, the hips should be high, the membrane ruptured, and the cord pushed back by a catheter and loop above the head. The catheter may be left. In case of imminent danger to the child a version should be done at once; but if the child is dead, leave it alone. In such cases the woman's breasts, etc., must be cared for.

MATERNAL DYSTOCIA.

Inhibitory influence of the nervous system may suppress pains temporarily. The entrance into the room of a strange doctor, or a fright, may inhibit them for a time. The influence of fear of the pains may for a time stop them, especially all voluntary efforts at expulsion.

Primary uterine inertia I have never seen except as the result of exhaustion and associated with some faulty position. The inertia

is nature's rest and should be left alone unless in the second stage, and then only because of the child. Inertia in the first stage calls for careful examination, lest some malposition is at its foundation. If the woman has been sitting or lying, to get up and walk causes gravity to assist and will often start the pains. When inefficient, a large dose of quinine, seven to ten grains, is a general stimulant and is of value, but I believe it is far better to allow the woman absolute rest and, if possible, sleep, if the membranes are intact and nothing seems to demand delivery at once. I have seen such cases sleep peacefully all night except for occasional feeble pains, and after such rest proceed to a quick and forcible delivery. It is very easily diagnosed by the feeling of the womb during a pain.

During the second stage inertia is most common, and is especially prevalent among the well-to-do and constitutionally delicate. Such women are unused to pain and suffer greatly. Their emotional and hysterical nature is at high tension, and the factor of nervous exhaustion and inhibition contributes to the result. In some cases chloroform removes all this, and behind it is found a womb by nature capable of performing its work. Pains can always be set up by dilating the os with the fingers periodically or by traction on the forceps. Prolonged labor usually ends in inertia and so saves a rupture. In its presence be very careful not to extract the baby too quickly, for there is little contractile power and the tendency is toward postpartum hæmorrhage. The baby should be taken even slower than would be the rule in normal labor, to allow of adequate contraction. It is one of the dangers of forceps that we have such control of the head that we are apt to yield to our desire to relieve the woman and spare her prolonged pain at the expense of safety.

Now the pathological conditions that favor or directly cause inertia or, perhaps better, weak and irregular pains, are many, but will be understood under a few heads:—

1. Defective innervation, which can be helped by quinine or strychnine.

2. Defective muscularity, secondary to disease or relatively unable to overcome the resistance of mild contractions or any obstruction.

3. Abnormal shape of womb, the result of adhesions, fixations, or torsion.

4. Tumors or disease of the uterine wall, so that the force is not effectively spent.

5. Adhesions of chorion to wall—very rare.

6. Abnormal position of the womb, when, from pendulous abdomen, kyphosis, or other reasons, it is not contracting on the axis of the inlet.

7. Excessive distention from twins, amnion, etc., where the muscle is too thin to get a grasp on the fœtus.

8. A hereditary tendency to a poor womb muscle—these families have few children and a history of forceps at nearly every birth. This class is on the increase among pure American stock.

9. Age atrophy in old primiparæ.

The suffering is often great, but the force is feeble and nothing is done. In the first stage but little dilatation, in the second no advance of the head. See that Bandl's ring is not present or forming. Save the woman's strength, don't let her bear down, and use opium if very nervous. At times a hot vaginal douche relaxes the parts. Often if the cervix is fairly open, but the waters do not bulge, there is an adherence right up to the os. In these cases sweep the finger around and strip the membranes from the wall for a few inches, but be careful not to rupture. This must be done between pains.

Possible causes might be fracture of pelvis and exostosis, osteomalacia with deformity since a previous labor, hæmatoma, thrombosis, or œdema of vulva or vagina, rectocele or vesicocele, vesical calculus, or impacted fæces.

A tetanic spasm of the womb is very rare since ergot has ceased to be given during labor. I refer to a spasm of all the muscular elements. It will yield to chloroform.

Precipitate labor is not uncommon. In large pelvis, small babies, and relaxed multiparæ, it is not at all rare for the second stage to be exceedingly rapid—one long pain or contraction—not resting until the head is born. These women are usually placid and cow-like, with little feeling of pain. If the woman were erect there would be danger to the child in falling. There is danger of postpartum hæmorrhage and lacerations. The treatment is to retard it all that is possible. The mere holding of the head will end the pain, which seems to be kept up by the advance of the head; at least when it is firmly held back the pain will end.

Atresia of the vagina, congenital or acquired, might cause dystocia. It would probably be at once noticed. Vaginæ differ much in size and shape. A septum or double canal might complicate. Rigid or imperforate hymen might be a cause—Dr. Cole's case. A rigid perineum would be a bar to advance until torn or tired out and paralyzed.

A rigid, unyielding cervix is fairly common in primiparæ. In other cases scar tissue may poorly dilate. Time is the element that seems to act best in softening them.

In posterior high position of the cervix from anterior tilting of the womb, it is often a good plan to hook the finger in and pull down, though it is very hard to reach many times. I have not had success at it.

Cancer of the vagina and cervix may be a bar to labor and require section. Under the added blood-supply of pregnancy, malignant growths increase rapidly. Such women should be aborted. Such a womb cannot be removed, but local cauterization will help her. Such women, if mothers, should be kept alive as long as possible. The instruction given under the shadow of impending death in a few months is of priceless value. Her every word is burdened with a wealth of love and solicitude that will not be forgotten by them in after years.

A large fibroid may be an absolute bar to labor, the lower the more dangerous. Section at term is the treatment if large. Such tumors prevent contraction and postpartum hæmorrhage is quite the rule.

A cyst of womb or ovary may prevent labor. tapping it may allow of birth.

A dry labor is dystocia. The pain of contracting on bony points inhibits, dilatation is poor, and the danger of rupture is greatly increased from the contraction on a rough surface. These labors should not be allowed to drag, and forceps are indicated early.

A short cord may cause dystocia; six inches has been met with. There is no diagnosis until it occurs, and no treatment. The usual length is twenty inches from head to navel, anus to navel is twelve to fifteen inches. This is required to give birth to the head. If around the neck a few times, a normal cord may be too short; twelve to fifteen inches is just enough. Shorter lengths are rare, but have occurred. The result is that the placenta is prematurely torn off or the womb is inverted. The baby will be dead or still-born. There is no possibility of diagnosing it until the emergency is met in the second stage. Advance of the head is at once arrested. While it will advance a little with the pain, it will spring back at once. The pain is severe. Hæmorrhage is sure if the placenta is separated, and during the pain a flattening of the placental site is said to have been felt. It may be suspected when there is:—

1. Recession of child after the pain and no advance, that cannot otherwise be accounted for.

2. Arterial hæmorrhage for no cause during and between pains.

3. Greater pain referred to womb, and a desire to sit up and lean over to shorten distance.

4. Flattening or inverting during pain.

5. Uterine inertia following these symptoms.

6. Urination between pains.

The treatment is to apply forceps and deliver the child and placenta at once, or, if possible, clamp and cut the cord. Until the womb is empty hæmorrhage will continue if any separation occurs. The cord is always stronger than the placental attachment.

OCCIPITO-POSTERIOR POSITION.

The type of this is R.O.P. and will be so considered. This is dystocia and will be considered under three heads:—

1. Engagement and entrance of the head at the superior strait.

2. Rotation normally and anterior position—90 per cent. will so rotate.

3. Persistent posterior position of the head.

In the first, labor is always longer because the head does not so easily conform to the inlet. Rotation is over five-eighths of a circle, instead of three-eighths normally. The pains are always irregular and imperfect. Just why this is so is not known, but is probably due to the little done and slow accomplishment. Nothing seems to stimulate the pains like steady advancement of the head. The first stage is long and tedious, and the head poorly adapted as a dilating agent. If lines be drawn parallel from sacral promontory to right ilio-pectoneal spine, and from pubes to left sacro-iliac notch, it will be seen that the anterior corresponding in L.O.A. to the biparietal diameter is much wider. In a posterior position the wide part of the head is applied to the narrow part of the pelvis. This results in the parietals checking their advance, while the brow descends and tends to extension of the head to the occipito-frontal plane at the inlet.

Also, the brow moulds easier than the occiput. In a posterior, it is the front that must yield. All this takes time and force.

Now, having passed the inlet the rotation is entirely different from that in L.O.A.; whether it will rotate anteriorly (2) or remain posterior (3) is a matter of how well flexed the head is when it reaches the excavation.

In the second, if it is normally well flexed, the brow is above the inlet when the occiput is below the perineum of the sacrum. Here

it has plenty of room and at once goes down to the floor. The occiput is in the hollow of the sacro-sciatic ligaments between the sacrum and the right ischium, while the forehead is on the smooth surface of the pubes. The occiput goes down and meets the diverting force of the perineum, constantly more and more flexed as it descends. This tends to send the occiput to the front, and as it yields it is not opposed by the forehead, which slips back on the smooth pubes. But it has five-eighths of a circle to rotate, and this takes time and force. This is the normal and favorable ending of a posterior position. Of a thousand cases at the Sloane Maternity, 194, or 20 per cent., were posterior which became anterior. They are certainly more common than once thought. L.O.P. is to R.O.P. as 27 to 7. The whole key to the condition is flexion of the head, which, if sufficient to get the occiput low enough to pass below the spine of the ischium, will rotate forward inevitably, the ridge marking the posterior limit of the anterior plane being more feebly marked and not retarding the forehead from slipping over. This rotation is slow and may not occur until the pelvic outlet is reached even. To do this there must be a firm perineum, strong pains, and a well-flexed head. Efforts to change posterior to anterior by the hand posterior, are usually valueless, since it is at the perineum that this normally occurs. If above brim, use version; if below, use forceps; but be in no hurry. Shoulders as well as head must turn. Axis traction alone and no efforts to rotate blades should be used. They are hard to diagnose by touch. It must be remembered, too, that the perineum is not a rigid body, but a yielding one, and not uniformly yielding, for it is soft in front and quite hard behind. This also effects the diameter of the occiput, for it will tend to follow the direction of the least resistance, which is to the front. Nor must the direction of the pyriformis muscle be lost sight of, for it plays an important part in the first direction of the head to the front. It has been stated that this alone would cause the occiput to fall in front of the spine on the anterior plane.

Now, should the head enter the pelvis unflexed, it will be a persistent occipital posterior inevitably. The occiput will descend as before to the pelvic floor, but the forehead is not free to move as before. It is not only fast, but tends to crowd forward on the anterior plane. The occiput yields to the backward turn of the posterior plane and conforms to the sacrum. Here it is possible for the force rotating the brow forward to equal the force rotating the occiput forward, and the head will become jammed in the pelvis; but more often the brow goes forward. The deeper down, the more prominent the limiting

line of the anterior groove, until it is more marked than the edge of the sacrum. The deeper the forehead, the more rigidly it must follow this groove. While if flexed the brow goes back rapidly on the smooth pubes, if extended it is the occiput that slips on the sacrum. The result is that the occiput must travel the whole length of the sacrum, a tear of the perineum is inevitable, aid to labor is almost always required, and labor is long, complicated, and severe.

Between these two types there have been clinically observed, though admittedly rare, cases where the head has entered extended and still rotated anteriorly. In these cases the head enters and descends. The head must be relatively small; and when it reaches the edge of the posterior anterior plane it there stops, while the pains continue and flex the head. This flexion will at length become sufficient for the normal rotation to occur to the front.

PERSISTENT OCCIPITO-POSTERIOR POSITIONS.

The permanent posterior positions of the vertex are to be considered dystocia in every sense. Labor is always slow from lack of flexion; internal rotation is always tedious. It occurs equally in multiparæ and primiparæ in 4 per cent. of cephalic cases. It can only be termed persistently posterior when imperfectly flexed.

The cause is always an incomplete flexion, whereby the forehead first meets the resistance of the pelvic floor and is deflected forward. Were flexion perfect, this could not occur. Likewise conditions relaxing the pelvic floor, unless flexion is perfect, may result in the same condition, so it may properly be said that a torn perineum, roomy pelvis and small head, the second child in twins, pelvic deformity, and any condition destroying the tonicity of the perineum are direct agents in its production.

A head descending in a posterior position not totally flexed (namely, with the fronto-occipital engaged) cannot rotate past the short transverse and must rotate backward. It is dystocia because the occiput has 7½ inches to travel as against the normal 1½ inches. There is also danger of impaction. In anterior positions the shoulders do not engage until the head is born, but, the distance from trunk to vertex only being 3 inches, the shoulders must enter the superior straight before the occiput can travel the 7½-inch distance. We would then have, were flexion to become extreme, the fronto-mental of 3¼ inches, plus the dorso-sternal, 3¾ inches—equal to 7 inches—in the pelvis at once, which is impossible. Extension is therefore to be desired in posterior positions of the head.

Practically, the perineum is greatly distended and usually tears as it retracts over the occiput. The moulding is great, and elongates the head by a shortening of the occipito-frontal and occipito-mental.

Again, the head may come down in extension, *i.e.*, face, and become impacted in the effort to rotate through the transverse diameter.

It is easily diagnosed by the abdomen or vagina.

The mother is subject to the danger of a long labor, exhaustion, laceration and shock, pressure, necrosis, and sepsis. About 10 per cent. of the children die. There is no way to change the child when labor has begun. The knee-chest position of Reynolds has never succeeded with me, and I have left them alone until I applied forceps. As spoken of before, most cases will correct themselves, when possible to be done, without aid. As they occur in inlet, excavation or outlet, they are classed as high, medium and low cases and treatment is better understood when so considered.

High Cases.—High cases are not rare and usually correct themselves.

(*a*) Rotate the child by external manipulation—it may be done by others, but has always failed me.

(*b*) Rotation of head over promontory by hand or forceps. In this I have never succeeded but once, and it would probably have occurred anyway.

(*c*) Apply forceps and attempt to rotate. As the forceps will not sweep a circle in the pelvis, I can't see how it can be done; and the time to apply forceps, which are usually demanded, is later, to aid the force, not to correct the position.

(*d*) Podalic version. Wherein this is better than to wait and use forceps, I can't see.

Medium Cases.—Endeavor to flex the head by pressure on forehead, and use forceps if pains fail. After engagement I have never succeeded in changing the position of the head noticeably.

Low Cases.—This is the most common condition requiring help, and it is best to wait until this time for spontaneous rotation.

(*a*) At the first sign of delay or failing force, use forceps. If you deliver posteriorly, a tear is sure.

(*b*) Rotation by forceps as advised by some is always risky, and is condemned by most. Theoretically, here the forceps can rotate the head. Practically, I have never dared to try it, preferring a tear. I insist on applying forceps low in every posterior case in order to control the head. By them, I can keep the head perfectly flexed, even to moulding the forehead against the symphysis, and can hold back

the head as long as I wish, thus saving the perineum all that is possible.

Persistent mento-posterior is very rare, less than 1 per cent. of face cases. It is an absolute lack of extension, as in small head and justo-major pelvis. The chin does not go in deep enough to be deflected by the floor. In a deep pelvis the head may strike the floor before the chin and is rotated forward, the chin back. It is always a face case. The rule is absolute that the "chin must be front." The labor is impossible, as shoulders enter with the head. All children die; and if the chin cannot be flexed into a brow or vertex, section alone is left. Forceps are useless.

A transverse engagement of the head is nature's way of getting through a pelvis with contracted outlet. It is primary in flat pelvis, masculine type, and congenital double hip-joint. It is secondary in large heads and broad occiput, which is posterior until it reaches the floor and then rotates and lodges at the transverse diameter.

Spontaneous delivery is rare. Forceps will usually correct the trouble.

CHAPTER XIX.

MISCELLANEOUS.

DETERMINATION OF SEX.

In all ages and in all races there have been rules thought to favor parturition, either by rendering labor painless, softening joints, or making the child smaller. Meggs mentions the anointing of the mons with lily ointment, while slippery elm tea, helonias root, Christian Science, and such fads have or have had their deluded advocates, pitifully endeavoring to escape the primeval curse. The woman's efforts may be amusing, but who can blame her motive?

The child is a parasite and will usually have its needed food, regardless of the mother's welfare or health as shown in the decay of teeth, osteomalacia, etc. Nothing but actual starvation of the mother will affect the baby. Vegetarians claim much, but I never could see but that they suffered with the average woman.

Within the last few years Prochownick has tried to underfeed the woman and get a smaller child. He hoped that it would take the place of section, symphyseotomy, or premature labor in some cases. In selected cases he seems to have modified the child, but only at the expense of the mother's health. No one in America seems to have tried it, or, if so, to champion its cause.

Prochownick cuts off fats, carbohydrates, and water to the least possible point that the woman can stand. In the fall of 1907 he sums up his cases as follows:—

1. The woman stood it well after a time, and then weight remained uniform.

2. When comparison could be made, labor was easier.

3. All the children were born alive.

4. All the children were markedly lean, free from fat, and cranial bones were freely movable.

5. The children were normally developed and mature at birth. Lactation was normal.

He begins diet at the seventh month. For breakfast, 2½ ounces Zweiback and a little butter. For lunch, meat, eggs, salad, and cheese. For dinner, the same, with bread and butter, 2½ ounces. No water,

soup, potatoes, beer, sugar, or starch. For liquids he allowed 10 to 14 ounces of thin, red claret per day.

It may be worth a trial in a case of previous dystocia and substandard pelvis, or crossed races, large paternal head, large bones, where but little is to be overcome and the woman is willing and able to try it, provided thereby her strength is not lessened. I would consider that muscular strength would outweigh such slight lowering in the child's weight as could be gained by any plan of feeding.

In 1901 Schenk endeavored to determine sex by feeding. That food will modify sex is well known. Bees so alter the sex; in cold weather, when food is scarce, caterpillars are mostly males; and the same is borne out in mammals. Abundance of food seems to produce females. To produce male infants, Schenk takes the normal woman, examines her food and urine as an index to metabolism, and then starves her and adjusts the food until the albumin waste is in excess of that taken in. He has apparently succeeded a few times. But we know that the fœtus will get food at the expense of the mother, and this is a very crude way of reaching the fœtus. We cannot determine the extent of placental attachment, the ability to absorb food on the part of the child, nor the ratio of uterine circulation, all factors to be considered. The fœtus might be abundantly fed in a starving woman, or be starving in a plethoric woman, aside from all general nutrition of her body.

Starkweather's law, that the parent of most sexual vigor produces the opposite sex, is without foundation. What is sexual vigor? Is it general health, muscular strength or sexuality, or what? The ages of the parents relatively was once thought to influence the sex, but this is uncertain; but there does seem to be a hereditary tendency in some women, for unknown reasons, to produce one sex, even with different fathers. It is not likely that the ovum is predetermined, and we know that the ovaries do not determine it. The change is no doubt nutritive, perhaps a development before fertilization or the result of food after; but it is too uniform to be chance, and has a law as yet unknown to govern it. The fact that unioval twins are always of one sex, though not always equal in weight, would carry it back to the ovum. Males are born in the ratio of 106 to 100, though at puberty they are the same. Illegitimacy, age of parents, time of conception, deformity of pelvis, sex vigor, tendency to opposite reproduction, racial needs, race decadence, etc., have been suggested and disproven.

ARTIFICIAL IMPREGNATION.

Artificial impregnation has been successfully done in mares and a few times in the human species. J. Marion Sims succeeded in a few instances. The semen must be at once transferred before it is chilled, and repeated attempts are required. It will probably never become popular.

PREVENTION OF PREGNANCY.

The human race is peculiar in that there is but little sexual periodicity in the female. I believe the race would be happier and the offspring sounder if this were so and intercourse occur only for conception; but it is not. Generations of female yielding to man, call it slavery or by whatever name you please, has modified her feelings in this matter. Society being as it is, there is but one thing for the woman to do if she is to have any control of her liberty, and that is to prevent conception until she is willing for it, as long as she cannot prevent intercourse. While I absolutely condemn the taking of life, or murder of the unborn infant, I concede to the woman the right to prevent this, exactly as she could have done by not marrying at all.

I think there is a growing distaste for the family duties among women, however, that should be condemned. The efforts of women to equal man in studies, work, etc., while still claiming their sex privileges, with the dissipation of club and society life, are leading to a "race suicide." This ought not to be. Woman is anatomically, physiologically, and emotionally evolved for one sole and single purpose, any departure therefrom being done at the violation of her best ideals and a misdirection of energy. The world's work is best done when each part of the machine is working at its best efficiency without friction.

There are many methods in vogue to prevent conception, and few that are not very objectionable. The limiting of intercourse to a week, midway between menstruations, is of little value and is not physiological for the female, since rut and menstruation are the same. The spermatozoa live at least two weeks in the tubes, and would fertilize any ovum. The practice of withdrawal is absolutely pernicious and will soon lead to nervous collapse, especially on the part of the female, who is robbed thereby of the orgasm entirely. It is infinitely worse than masturbation.

The use of rubber appliances in the form of womb-veils, stem-pessaries, condoms, etc., is nothing more than masturbation under

circumstances to heighten the feeling; there is no contact of the parts, and it is morally pernicious and degrading. There are no vaginal cones or suppositories that are effective at all. The great objection to all these is the feeling of safety, and the therefore positive invitation to illicit intercourse they foster.

It is sad, but true, that the main fortification of female chastity has been, and for years will be, the fear of conception, not any innate distaste or modesty. In fact, the function of modesty is not to prevent, but, by inciting the male, to actually promote union of the sexes.

There is but one method that is worthy of trial, that comes anywhere near fulfilling requirements, and that is the use of a fountain syringe directly after intercourse. It will not always prove effective, for the womb in orgasm tends to suck up the semen where it cannot be washed out. But it is reasonably safe, and is not in the hands of improper persons, nor is it so easy to use and have handy that it is liable to be used by the unmarried. Nature has placed this function as far as possible beyond the control of the parties after the sexual act. I would consider any effort to thwarting it inherently wrong and pernicious, but to be in the nature of a necessary compromise as we live to-day.

Unfortunately we are working out our own salvation, unaided by the moral thoughts of the clergy, who are equally as guilty as the laity, if not more so, and have no words of exhortation or warning to offer. They ignore the whole subject as if it did not exist. This clerical Podsnapery loses us valuable ideas and timely warnings. Inability to handle the vital subjects of to-day is the cause of the waning faith and lost influence of the churches. I am not a Roman Catholic, but I except them from this accusation, and honor them for their denunciations of abortion, etc., given in no uncertain terms direct from the pulpit.

As a physician, I should be very loath, and then only for cause, to advise efforts at prevention, for I feel that nature knows best when the woman is fitted for child-bearing. Self-control, so needed at every step of life, is not lost when exercised in this case by the husband. If the whole subject is left to the woman and her instincts are unhampered, it will usually work out all right.

An innocent cause of sterility is often the abuse of antiseptic injections for cleanliness. A woman douching herself daily could not, in the nature of things, become pregnant, and a condition requiring this with any regularity is one needing a physician's advice.

The usual conditions demanding prevention of conception are

dyscrasias liable to transmission, syphilis, leprosy, insanity, tuberculosis, cancer, heart disease, pelvic deformity, etc.; every one of them a real bar to marriage. Our lax laws of marriage, plus ignorance of the subject, make the union of the unfit as probable as otherwise. I have written so much on this subject because it is of such vital interest to the race, and so little thought of, rather than for its bearing on obstetrics.

ANÆSTHESIA.

Sixty years ago Dr. John Warren amputated a leg under the first anæsthesia in the United States. The amphitheater went wild, but Dr. Warren, walking with his head down at the completion of his work, and seeing the glory of the surgery of the future, could only brokenly say, "We have seen what we have seen, I can say no more." Since that day a power has been in our hands unequaled for the alleviation of suffering. It was a long time before its use became general in obstetrics. It should be used in every case where the pain requires it; but not all women need it, nor even then until the end of the first stage. It not only frees the woman from much suffering, but it regulates the pains without inhibiting them; when complete, it relaxes the abdominal factor of them, and by the same relaxation saves the perineum. In very nervous women the dread may actually stop the pains, which, under chloroform, become more powerful.

Chloroform alone should be used, as it is quicker in action, is not inflammable, and is not an irritant to the kidney, which will soon have so much to do. It should not be pushed; only enough given to deaden the acuteness of each pain is needed. The idea that it promotes postpartum hæmorrhage could only apply to an excessive quantity, and the same holds good of asphyxiation of the baby. Even in heart disease the small quantity required to make the woman reasonably comfortable may be given. A good plan is to wad cotton into a tumbler and keep a few drops constantly on the cotton, and let the woman take it herself. If she becomes unconscious, she will drop the tumbler, and can never get too much. With gas burning at night, free ventilation must be had, for the chloroform will decompose and become very irritating to the lungs.

Before any operative procedure it is compulsory to chloroform the woman, except when using forceps. Here, if she is nervous at all, it is better to give it, but the woman can be of considerable help if she is in possession of her faculties.

Anæsthesia should not be given too soon, and when once begun

must be kept up until the second stage is over. It is best to push it to unconsciousness just as the head is born.

Chloral will induce sleep and is relaxing to a rigid os, but seems to deaden the pains very little. Cocaine to the cervix is of but little value. Spinal anæsthesia, "Corning's method" of cocainization, is very dangerous. It will cause a painless labor, but at a great risk and with disagreeable after-consequences. It has no place in obstetrics.

During the last few months the use of hyoscine narcosis has been tried. I had the opportunity to see its effects in but one or two cases of minor surgery and obstetrics. The narcosis to pain was marvelous and the apparent after-consequences nothing. The drug had no effect on the labor whatever except to render it painless while the woman slept. The action of the drug lasts for six to eight hours and two injections are usually required. It is too new a procedure for me to endorse it absolutely. There may be contraindications yet unknown and dangers not yet discovered that will render its use inadvisable. A little time will be required for this to be established, but I cannot but say it was ideal in its action in my limited observation and it, or a purified product, exactly administered, will, I feel sure, be in general use in another year to lessen the primal course of womanhood. The dose used was hyoscine $^1/_{100}$ grain, morphine sulphate ¼ grain, in 1 cubic centimeter of water. To this others have added cactin $^1/_{67}$ grain. Naturally, great care is used to have the purest of ingredients.

STERILITY OF THE VAGINA.

The vagina is sterile and even actively antiseptic during the last months of pregnancy. This is not true of the vulva, which swarms with life, and still less so of the rectum and anus, which cannot even be disinfected. During the last weeks of pregnancy the secretion of the vagina is acid and curdy, capable of killing the most virulent streptococci in three days provided it remains acid. That the vagina was aseptic was first stated by Gönner in 1887. In the same year Döderlein came to the same results, but found an extensive flora present. Important work was done by others, with varying conclusions. In 1892 Döderlein examined 195 women and announced two types of vaginal secretion.

First, a white, curdy, crumbly, acid secretion, containing epithelial cells and the constant presence of a thick bacillus which took his name.

Second, an abnormal type, more fluid and pus-like, less acid, or even alkaline, and swarming with germ life.

Cultures of the first were sterile, but the second always reacted, and in 10 per cent. contained streptococci; 55 per cent. were of the first type and 45 per cent. were of the second. Döderlein therefore thought douches required in 45 per cent. of cases.

In 1894 Krönig studied 100 cases, normal and otherwise, as they came, and found no germs present that were arobic except yeast and gonococci; he found Döderlein bacilli in all cases, and concluded that all women were antiseptic. This being denied by Döderlein, in reality the very pith of his discovery, Krönig took pregnant women and introduced cultures of streptococcus pyocyaneus and found them destroyed on an average in twenty hours, and in all cases more rapidly according to the abundance of Döderlein's bacilli. He proved that all pathological staphylococci were dead in twenty hours, streptococci in six hours, and in every case the vagina was sterile in three days and that douches delayed this process. In the same year Menge confirmed Krönig. In 1897 Krönig repeated his work, and showed that when any other result occurred it was from faulty technique. This was again proven in 1898 by the work of Williams.

The corollary of this is to keep douches out of the vagina, unless it is known to be actively infected, and to freely clean the vulva; and that every instrument, finger, or article whatsoever, introduced into the vagina, must be absolutely sterile and under rigid aseptic precautions, being introduced as seldom as possible and avoiding the known septic entrance. Especially must intercourse be interdicted after the seventh month.

The genital tract is in four parts:—

1. A vulva, swarming with every variety of germ life.

2. Vagina to cervix, that contains non-virulent bacilli, leucocytes, and Döderlein's acid secretion bacillus.

3. The cervical canal, which contains leucocytes but normally no germs.

4. Uterus and tubes, free from all life.

The chemotactic action, where the alkaline cervical and the acid vaginal secretions meet, is where the leucocytes are most abundant, and they form a barrier to invasion. Nearly all pathological forms of life die in acid media except the gonococci, which explains their virulence in the vagina.

Sepsis is never, therefore, an auto-infection, but must come from without, not by extension upward, but actual mechanical carrying up and depositing of pyogenic bacteria on what otherwise would be a sterile field.

SUPERSTITIONS.

Superstitions have gathered around every phenomenon of nature that has thrust itself upon the notice of primitive races unable to comprehend, but of necessity forced to explain them. Every race has explained them also in about the same way. Interesting as they are, but a few are truly in the domain of obstetrics. There is one, however, so wide-spread and so causative of mental anguish as to deserve especial attention. I refer to the common belief in mother- or birth-marks—the possibility of any emotion on the mother's part affecting the fœtus. Nor is there a united sentiment on this subject among physicians, so hard is it for a superstition once fastened into the belief of a people to die out. For example, the American Text-book confirms it; Dorland avoids it, but fears frights; Hirst believes in it; Edgar is on the fence; Webster says nothing, nor does Williams. Our most prominent American writers, then, either believe in it or dodge the issue. I want to deny its possibility absolutely, and for the following reasons:—

1. The fœtus is practically formed before the woman is aware of her condition. The rule is for the sight or fright to have occurred late in pregnancy.

2. There is no nervous or blood-connection between the mother and child. It is a parasite pure and simple. In fact, I believe fright is transmitted much more readily to the child after birth than before, even as an emotion, much less a physical change.

3. The nervous, easily frightened woman is no more liable than any other to this phenomenon.

4. It is no more frequent during scenes of rapine and bloodshed, as the "reign of terror," than at other times.

5. They occur about once in so often in nature, regardless of time, events, species, or outside influences of any kind; nor are they inherited.

6. No cases were ever predicted. It is only after the child is found marked that the retrospective mind recalls a shock that is assumed to be the cause. No woman can live nine months without some start. It is the old error, *"post hoc ergo propter hoc."*

7. When the cause is assigned, it is usually at the fifth month or later, while to change the fœtus it would have had to be in the first two. At the eighth week the clefts are closed, neck is formed, eyes, ears, nose, joints, extremities, fingers and toes, and all but sex are perfectly differentiated.

8. The very organs—as of sex—last to develop are the very ones least seldom affected by the supposed fright; whereas the ones earliest formed, and more subject to errors of cell arrangement, are the ones most often found defective.

9. Impressions are not inherited. Continued sight does not alter the offspring. For example, sheep have had their tails cut off for generations, yet the lambs have tails. Three thousand years of circumcision has not bred out the foreskin among the Jews. The house cat dates from Egypt, yet is the same in instinct that it always was—no more affectionate, no less a feline.

10. Timid animals, as the deer or hare, that save themselves by their easily alarmed fears, "mark" their offspring no more frequently than do others.

As one writer has put it, either extraneous influences will mark a child, or they will not do so.

Assuming that the first is true, then it follows that if responsible it must antedate the defect and be prior to its development; or, if not prior to its development, these deformities are merely accidents of development. At least, then, the advocates of "marking" must be certain, when they see a hare-lip, that the split-nosed pointer dog that jumped on the woman did so before the eighth week. Still, it will no doubt be firmly believed in as long as people continue to plant potatoes by the moon.

But the sad feature of it is to see a frail, sensitive, emotional, over-conscientious woman brooding and sorrowing over the fear and dread of a marked child because of some shock her nervous condition has magnified. Her suffering is all the worse because of her very conscientiousness. She has for her physical welfare a capable physician; but can he "minister to her mind diseased"? I say, yes, fully. Nothing gives me more real satisfaction than to expose this horrible belief and see the relief that it brings. If you can't endorse my conclusion, at least explain to her the arguments and give her peace.

Around the function of menstruation has come up a crop of dragon's teeth. Even as late as 1878 a member of the British Medical Association wrote to the British Medical Journal, asking if it were true that a menstruating woman curing hams would spoil the meat. He had known it to happen twice. Another member said it was so, and was surprised that the fact was questioned. On the continent menstruating women are not allowed to make butter or cheese, can fruit, or walk across growing grain. Musical instruments snap their strings,

and all nature, we would suppose, is convulsed. Even to-day operations are dreaded at that time by the ignorant. It is merely the old "taboo" of barbarism, kept alive by the Jewish "uncleanliness," to linger in the folklore of our race. Less than ten years ago a physician told me menstrual blood was a sure cure for warts.

Telegony is the name of a supposed law that the first impregnation sets a stamp on all future ones. Stock-breeders claim this is true, but have failed to prove it. It is probably a remnant of savagery, where the descent was by the mother, crystallized in the Mosaic law of raising seed to one's dead brother, necessary then to keep land inheritance in the family, and still living. Plato advised the surrounding of the pregnant woman with articles of beauty, which, if it conduced to a better maternal health, might well react in more beautiful, because more healthy, offspring.

Menstruation being a time of sexual height in woman, coitus then would be more normal than at any other time. Intercourse then is not conducive to gonorrhœa, but in unclean races might give a urethritis. For this reason the wisdom of Moses made the woman unclean at that time, or "taboo." The belief that it would result in monsters is but a superstition, nor will coitus on either side determine sex, or oiling of the mons and pelvis cause easy labor. Allied to this subject is the vomiting or nausea of the husband replacing that of the wife, of which I have seen several examples. It is only after the first pregnancy which was attended by considerable suffering. On the second, by sympathetic action the husband seems to have it, while the wife is not free; but this is forgotten in the anomaly of the father's discomfort. It is purely the result of mental impression.

RELIGIOUS AND LEGAL STATUS OF CHILD.

In foreign countries, particularly in England, where estates are entailed, it is very important to know whether the child lived. In England it must be born alive and capable of independent existence, with no malformations or atresia recti that would destroy it. Negatively then, no assault would be committed if a child not so born were killed. In the United States there have been no decisions on killing a monstrosity.

Regarding labor, the Catholic Church has formulated some rules that physicians must know and be prepared to follow. After the twenty-eighth week the child is considered viable and premature labor may be induced to save the mother, but not before.

Craniotomy is never allowed on a living child. "Thou shalt not kill," is the commandment, and the mother is considered the aggressor. Likewise abortion is absolutely forbidden—*"nunquam licet directi procurare abortum."* The Holy College, when asked if ever allowable under any circumstances, replied, *"Tuto doceri non posse."* The dilemma is avoided in this way. While it is not allowable to perform abortion, it is permitted to remove disease from the mother, even if thereby the child is killed. In a forceps case the amnia might be drawn off, even when one knew that death to the child would inevitably occur. It is but fair to state that authorities in the church differ some on this point of interpretation. In the face of such an emergency, by all means call to your aid the parish priest and rely on his decision with the family.

Baptism is a required sacrament of the church and can be administered by any one, but must be done in one way to be effective. Procure a clean bowl of water, direct from the well or hydrant, and with clean-washed hands sprinkle the water on the head of the child if possible, repeating the following formula: "Holy child, I baptize thee in the name of the Father (sprinkle), and of the Son (sprinkle), and of the Holy Ghost (sprinkle). Amen." If the child be dead, this must be done before its birth, while the head is distending the vulva, or a syringe may be used, and the same formula repeated. If in doubt, it is well to repeat the process with this formula: "Holy child, if thou art not already baptized, I baptize thee in the name of the Father, and of the Son, and of the Holy Ghost. Amen." In the case of monsters, "Holy child, if thou canst be baptized, I baptize thee in the name of the Father, and of the Son, and of the Holy Ghost. Amen." These words must be repeated exactly, and the head sprinkled when possible, as the head is the site of intellect, though a foot or any part will do when the head cannot be reached. The church, too, considers the frailty of mankind and takes cognizance of the intention rather than the deed.

COFFIN BIRTHS.

From time to time we hear of births taking place after death of the mother, often in the coffin or grave. This led to the old Numa Pompilian law of section of every woman dying close to term. Animals have been delivered alive hours after the death of the mother. Brunton cut out a live child fifteen minutes after the death of the mother, etc. Coffin births may be the result of uterine action, since

it resists putrefaction the longest of all parts and may be assumed to die slower and retain contractility longer than other muscles; but the majority of cases are probably the result of abdominal gas presence and rigor mortis. It is certain that the child is dead very soon after the parent's death and long before burial takes place, so we are spared any harrowing thoughts of possible birth of a living child.

CHAPTER XX.

OPERATIVE OBSTETRICS.

UTERINE TAMPON.

THIS is used to control hæmorrhage, induce labor, or for its medicinal action in sepsis and to favor drainage.

A medicated gauze is preferable to a plain gauze, which is liable to decomposition. Five yards in length by three inches in width is the convenient size. It should never be placed without a speculum. The cervix is steadied by a tenaculum and the fundus by the hand. The gauze should touch nothing, if possible, and the packing must not be too tight. Under no circumstances should this be attempted without a speculum, for the vagina is not sterile. The gauze must not be left in place longer than twelve hours, and then be followed by an irrigation of saline solution. The ends of the strips must project free from the cervix.

In packing the vagina a ring is to be placed around the cervix before filling the vagina. Oozing of serum from a tamponed womb means that the clot is contracting, not a new hæmorrhage. If there is blood, the whole mass should be at once removed. It has never proven very satisfactory for stopping hæmorrhage.

ARTIFICIAL RUPTURE OF MEMBRANES.

Artificial rupture of membranes may be required when they are very tough and after the os is dilated. There is no hurry about it, but it should be done before birth, lest the baby attempt to breathe while in the sac. The best time is when the vulva is distending. The membrane must be broken before version, forceps, or any operative procedure on the child. It is easily done by a piece of wood, one blade of the scissors, or a roughened finger-nail. It should only be done at the beginning of a pain, when the womb is actively contracting, lest the cord be washed out. The descent of the head is hastened by this when the os is dilated. The womb seems not to be able to act effectively until considerably contracted, and for this reason it will be required in the following conditions:—

1. Hydramnios, or labor will be slow.

2. Primipara, with very low head, a thin cervix, a scanty fore-water, and feeble pains, because in these conditions the wall is distended and has little power.

3. When uterine contractions are delayed by concealed hæmorrhage.

4. When a sausage-shaped bulging exists that is not forcing out the os. Here the head will work better than such a poor dilating agent.

5. In multipara, when the head is high, cervix not thin, and membranes do not become tense with each pain.

DILATATION OF THE CERVIX.

Dilatation of the cervix is frequently required as a preliminary step in some other operation. There are three methods of so doing:—

1. Instrumental. 2. Manual. 3. By dilatable bags.

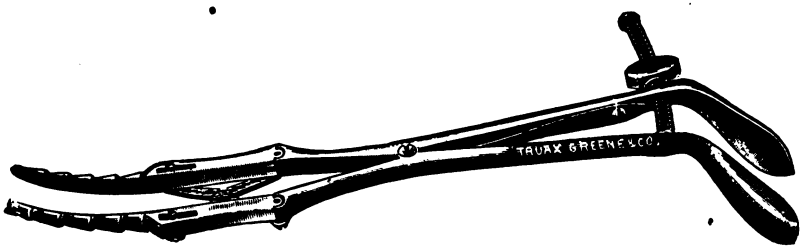


Fig. 83.—Goodell's Cervical Dilator.

The first is the most rapid and also the most dangerous. The second is slower, but, since the hand is the most perfect of all instruments, it is much safer. The third is very safe, but is too slow for most emergencies.

The dilator of the type of Goodell is required in every miscarriage, to admit of the curette or finger. It is to be used slowly and steadily and should be preceded, if possible, by a cervical tampon, which in a few hours wonderfully softens that organ. There is no advantage in the slower graduated bougees. A steady pressure is all the force justifiable. A sense of giving way marks submucous laceration that means a tear if the force be persisted in. The Bossi branched dilator is a powerful instrument, capable of great injury, and has few advantages over the hand, except saving fatigue. I am frank to admit that I am afraid to use it.

The manual, or Harris, method requires enough opening to admit

one finger. It is used when sudden delivery is required, and only at term. When the os in labor is very slow to dilate it may be done to assist nature. The os dilates under downward pressure, so the finger should hook over the rim and pull down as well as press outward. Work in one finger, then two, three, the thumb; and when the first can be drawn out, the cervix is dilated. Edgar has a method using two hands. The first fingers of both hands are hooked in and forced apart. It does not give one hand a chance to rest, and exposes the whole field to air contamination. He claims for it a closer imitation of nature, a preserving of membranes from rupture and no change in the presentation, no pressure on the hand causing fatigue, and less danger of sepsis, when there is in reality more risk. In unskilled

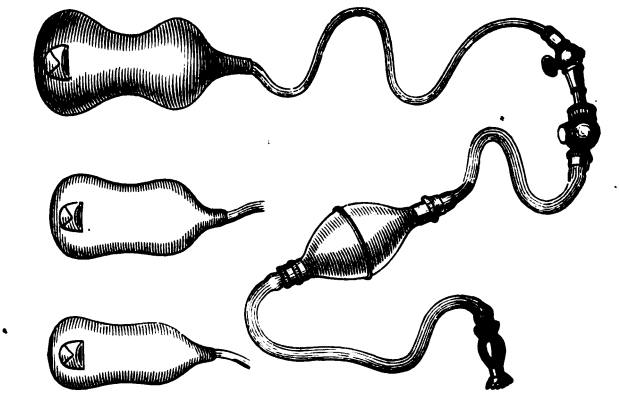


Fig. 84.—Barnes's Bags for Cervical Dilation.

hands, it is very dangerous and rupture may easily be done. The main fact to observe in any method is to take plenty of time, half an hour if possible, lest the womb be ruptured. The third method, by bags, is the nearest to the natural act, and the safest; but it is too slow for most cases. It is practically limited to induced labors. The Voorhees modified champetier of Ribes is the best instrument, because less bulky and not liable to burst. If they rupture, down prolapse the cord and fœtal parts. It is cone-shaped. A little pull—two pounds—on the cone helps the contractions of the womb. Any attempts to dilate the vagina or vulva are worse than useless, for the head alone can do it and not rupture. If a rupture is imminent, it is better to cut and anticipate it—substituting a clean cut for a laceration. Bags also displace the presenting part. In inducing labor, a good plan is to use them from two to ten hours and then use a bougie.

When the mother is in good condition and time is no object, which excludes hæmorrhage, the bag is the very best method. This embraces premature rupture of the membranes, uterine atony, malpositions, and prolapse. In all other cases a more rapid method is required. No form of bag is easy of introduction or ever free from the danger of sepsis.

The average time it takes to start labor with the bags is about six hours (two to thirty-six hours). The bag will soften any cervix. Use them in ordinary labor, delayed twenty-four hours, when meconium has passed or heart changes show the child to be in danger.

Another great use for them is in placenta prævia, to act as a tampon, especially when it is central and version is not easy.

EPISIOTOMY.

This is a lateral and downward cut of the vulva, to prevent a tear. It is rarely done and still more seldom required. If the head is held back it will surely dilate the vulva, which is far better than cutting or manual efforts at dilatation, and fully as effective. It is limited to contractions from cicatricial bands.

A cervical or stellar cutting of the cervix, where its hardness cannot be overcome by dilators, may be done. They must reach out to the vaginal junction, and not be shallow or one of them will be the start of a laceration. This laceration, begun, will continue along one cut and not be distributed among the others, and will surely involve the womb. It is a very dangerous procedure.

ARTIFICIAL DELIVERY OF THE PLACENTA.

There is a natural time for the placenta to separate and come away, varying in every case, but averaging about twenty minutes. This physiological time should be awaited for. Much damage is done in delivering before this point, and the procedure of "going after the placenta as soon as the child is born" is pernicious recklessness. No attempts should be made until thirty minutes after the baby is born, nor should the placenta remain longer than an hour. Credé's method is to grasp the womb, fingers behind, thumb in front, through the abdomen. The womb is rolled with the finger-tips deep down behind and the hand in front and firmly squeezed. This will start pains and expel the placenta. As it appears, it is to be hooked into and withdrawn in the curve of Carus, but only during a pain. The Dublin

method is nearly the same, but it is done regardless of pains. Failing in this, the cord is to be drawn upon, well backward, and twisted. The strain should not endanger tearing the cord, while the hand on the fundus notes the progress. It is the twist that loosens it. As a last resort, rarely needed, and then only after an hour's delay, it may be removed by the hand in the womb. Chloroform must be used and gloves worn. This is one of the most dangerous manœuvres of all obstetrics, and is generally followed by some sepsis. The finger-tips are to go above the placenta if possible, and one edge peeled from the wall. At the same time the finger-tips should sweep the wall, to see that no secondary placenta or retained parts are left. The curette is never to be used on a full-term uterus. In a miscarriage the conditions are entirely different. Here the womb is not able to expel the placenta, nor is it ready to easily separate—it must be removed. Few fingers will be able to reach the fundus, and a curette is needed, which should be dull and never sharp. Bleeding will go on until it is out, and delays are dangerous. At term there is no trouble in getting the hand to the placental site and it is easily removed entire. The danger of sepsis is the especial risk run.

BLUNT HOOK.

The blunt hook is on the handle of many forceps, *i.e.*, the Cole. It is never to be used except on a dead child, and rarely then. It will surely injure a living child, and often the mother.

FILLET.

The fillet is a very old and still useful appliance. A two-inch sterilized bandage is used. It is passed up and around the baby by a stiff catheter, then caught by forceps and brought down. It should be applied to every abnormally presenting part as a future identification. With the child in the proper axis it makes a good direct tractor. It is especially valuable in frank breech, around the back and down between the legs, as a tractor, and in placenta prævia to compress the os. Around the arms in a breech (version) case it will hold them down. In the Bible we read of the nurse putting a red string on the prolapsed arm of twins.

INTRAUTERINE DOUCHE.

An intrauterine douche must never be used until the vulva and vagina are first rendered sterile. Every step must be absolutely asep-

tic. The woman should be on her back; never in the Sims position, or air may enter. The utmost gentleness is to be used. Glass tips are the best, with a return flow provided for, and the bag elevated only three feet. Neither carbolic acid nor mercury should be used, because of absorption. The temperature must be hot, particularly to check hæmorrhage. Acetic acid, formalin, H_2O_2, saline solution, lysol, iodine, and glycerine have been used. Its use is practically confined to hæmorrhage and to wash out *débris*. It is rarely necessary to repeat it.

VAGINAL IRRIGATION.

Vaginal irrigation is not needed ordinarily, and should be done only when indicated and by the physician himself. The return flow must be unobstructed, and all pockets flushed out. It is quite an art to do it well. Nothing should get into the womb. I prefer the rubber pipe carried to every part by my finger, to any tip; and above all, I caution you not to use the general utility family syringe.

VULVAR DOUCHE.

The vulvar douche contributes to cleanliness and comfort. The outside should be flushed first, and then the opening. The stream should wash out all pockets, and it is well to scrub gently downward at the same time. This should precede all vaginal irrigation. This may be done by a well-trained nurse, but is as far as she ought to go. There is no objection to frequent irrigation of the vulva. As effective a method, and one free from temptation of entering the vagina, is to pour from a pitcher. The temperature should be about 100°, and salt solution is quite as effective as medicated solutions.

CATHETER.

The old teaching, never to expose a woman in using a catheter, has become obsolete in the light of asepsis. It should always be done by sight. The vulva should be irrigated prior to its use, and the orifice wiped off, with cotton left in the vulva to catch the last drip of the catheter. A douche should be given afterward. This instrument must be boiled and the hands sterile. A grooved director is sufficient if a catheter is not at hand. It will not be necessary to use it before twelve hours postpartum. If begun there is a tendency to depend upon it, and its continued use is not without risk and much annoyance.

POSTURE IN LABOR.

Certain postures are often instinctively and voluntarily assumed by the woman. What it was in a state of nature we can only surmise, but she probably walked in the first stage, stopping with every pain and bending backward. In the second stage she would squat, and at last be delivered on her side or back. They often bend backward in the first stage, like the Walcher position. While the head is high they stand, and when in the pelvis they want pillows behind them. The use of the obstetrical chair was a curious custom. It would travel from house to house to every case, for the woman's use. In oriental countries the woman sits on the lap of the midwife, leaning forward. "Behold my maid Bilhah, go in unto her and she shall bear upon my knees." (Gen. 30:3.)

As the joints are a little movable at labor, the subject of posture is important. The most important is the one last described under dystocia, which increases the inlet from one-third to one-half inch and the reverse or exaggerated lithotomy at the outlet.

The effects of gravity may be utilized in the knee-chest and Marion Sims position, and is useful in saving the waters, giving room for the hand in version and engaging the head, possibly. The Trendelenburg is useful in prolapsed cord. All postures to turn the child have been entirely negative as far as I am concerned, and I have no faith in postural version. The effect of gravity is very beneficial in the first stage, and I am glad to let the woman remain up as long as she can. In the United States the woman is usually on her back during delivery; but on her side in Europe. Both postures have advantages, but the back is the better, as raising the field above and out of the way of contamination. In hæmorrhage the head should be low, for obvious reasons.

EXPRESSION OF CHILD.

Pressure from above, to fix the head and expel the child, is as old as labor. The hands must be placed flat, and during pains pressure put on in the line of the axis. If the head is too large, pressure is very unwise. It is a help to the action of the abdominal muscles that may not be acting. An abdominal binder is serviceable in a relaxed, pendulous abdomen. In all breech cases the after-coming head should be followed down by the hand and may even be forced into the excavation, where it can be reached from below.

MANUAL EXTRACTION OF THE HEAD.

Manual extraction of the head has the same indications as forceps at the same point, and is far inferior in action. There is great danger to the perineum and the child's eyes. The plan of making pressure through the rectum or perineum is positively bad. The hands can do but little when there is real need for help, and the forceps are safer in every way.

ACCOUCHEMENT FORCÈ.

Accouchement forcè is the immediate and rapid extraction of the child, regardless of its welfare, to save the mother. There are three steps:—

1. The rapid dilatation of the cervix.
2. Grasping the child's head with forceps or the foot in version.
3. Extraction as rapidly as possible.

It is justifiable in conditions so serious as to render danger of uterine rupture, death of the child, or traumatism of secondary importance, as death of the mother, eclampsia, and placenta prævia. Even by experts it is very dangerous. Natural labor is slow and step by step. This is a violation all along the line. The more speed, the more danger.

SALINE SOLUTIONS.

The decinormal salt solution is made by adding 46 grains of salt to a pint of water. A small teaspoonful to a pint is a quick rule. The water must be filtered, sterile, and cooled to about 100° to 105°. The addition to this of 1 drachm of sodium acetate to the pint is an improvement.

Hypodermoclysis is the injecting of this under the skin in the loose cellular tissue of breasts or flank. No air must be admitted, and the tissues must be kneaded or rubbed, so as to absorb all possible. It is rapidly taken into the blood and dilutes the toxins, replaces the bulk lost by hæmorrhage, and increases the available water for kidney elimination. It is particularly useful in sepsis and eclampsia. The reservoir should be raised to a head of from three to four feet. No anæsthesia is required, but every part must be aseptic. It is a very valuable expedient, and a needle for its use should form a part of every outfit.

Enteroclysis, or high enemas, are slower in action, but fulfill about the same purpose. The woman should be on her right side, hips high, and the fluid should run slowly as high and as long as possible. Rectal infusions need no comment.

Intravenous infusions of eight ounces to one pint, with or without previous withdrawal of blood, is the most rapid way of replacing lost blood and diluting toxins. The median cephalic vein is usually chosen. A little air is now known to be harmless, but every precaution should be taken to prevent its entrance. The solution should be at 100° and it is very important to inject it slowly, watching the heart action. A head of two feet is enough pressure. The incision is one inch over the vein, which is rendered prominent by cording. A double gut ligature is passed beneath and out at the needle. One strand is used to ligate the lower end. The vein is not cut across, but nicked for the entrance of the canula, and around its tip the second ligature is tied. The blood will fill the canula, and while the solution is running slip the tubing over the canula. The tube and canula are to be held up and air will rise even if present. When all has run that is advisable, cut these ligatures short and bury them in the wound.

BREECH LABORS.

Breech labors are always slow and tedious, for the small end of the wedge is in front. They should be assisted when:—

1. No gain has been made in twelve hours.
2. A weakened pulse and exhaustion come.
3. Elevation of temperature.
4. Slowing of fœtal heart.

The aid given should be by seizing one foot and pulling until knee is at the vulva, or applying a fillet up over the sacrum. Application of forceps to the trochanters or use of the blunt hook is pernicious and unjustifiable. Pinaud suggests pressing one thigh out and back, to gain room for a grasp of the foot in some cases, thus bending the knee.

The breech is a poor dilator, and the waters should be conserved as long as possible. When the second stage is progressive nothing should be done until the navel is born, *i.e.*, the head is engaged and the cord is subject to compression. It should then be drawn down and pushed to one side if possible. The head should be pressed down from above and the child held up carefully. No pull should be on the child, for the neck will not tolerate rough handling. Every case should be enveloped in hot towels, for the shock of cold air is the great starter of respiration; and as soon as possible the finger should open the mouth, press back the perineum, and in every way endeavor to prevent inhalation of fluid. In every case of breech the forceps

should be ready for use, should stoppage occur in the critical five to ten minutes available before the baby would die from pressure on the cord. If a deformity is such that the breech cannot rapidly pass there, it is a certainty that the head cannot, and some operation is to be done at once. The arms must be down in every case. The feet, if flexed, are to be left in that position very carefully, to assist in dilatation. When the arms are extended they can be brought down by sweeping them across the chest, and the posterior arm is usually the easier to do first. The finger must get high up over the shoulders, and care must be taken not to fracture the arm or separate the epiphysis.

There is one condition—a dorsal displacement of the arm—that is very dangerous. It is only present when there have been attempts to rotate and the head and the arm will not pass at once. The child must be rotated back as at first, if possible, and the arm brought down in front. This rotation cannot be done by any twisting of the body, which will only wring the neck, but can be done with a finger in the child's mouth or on the chin, if not engaged. It is to prevent this that the head should be followed down from above and engaged correctly.

CHAPTER XXI.

OPERATIVE OBSTETRICS.

FORCEPS.

THE history of the origin of the obstetrical forceps reads like a romance. In 1569, just before the Massacre of St. Bartholomew, a French Huguenot, named William Chamberlain, emigrated to England. While the genealogy of the family is not clear, he seems to have

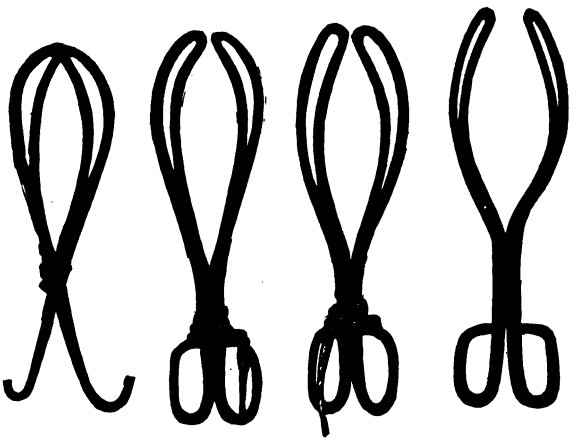


Fig. 85.—Chamberlain's Forceps.

had three sons, Peter 1st, Hugh, and Peter 2d. This Peter 1st was the inventor of the forceps, which he kept a profound secret, and attained a wide celebrity, with his brothers, in delivering women. In 1670, Hugh, son of Peter 2d, a spendthrift, appeared in Paris, and endeavored to sell the secret to Mauriceau for $10,000, a fortune in those days. Mauriceau, the leader of obstetrics at that time, turned over to him a deformed dwarf in labor three days, agreeing to purchase if she were successfully delivered. Hugh agreed to do so in fifteen minutes, but failed, and the woman died twenty-four hours later with a badly lacerated womb. The trade was off and Hugh left.

In 1688 Hugh sold his secret to the college of Amsterdam, who, for over thirty years, sold it to their graduates only, upon promise of secrecy and a large payment. History is conflicting as to how this

secret escaped; one version is that two men, feeling the injustice and wrong of keeping so valuable a discovery secret, deliberately pursued the studies, violated this promise, and made it public, to find that Chamberlain had sold only one blade, or the vectis. The forceps practically as we have it, double-bladed, was first made public by Palfyn in 1720, more than one hundred years after its invention. Its use rapidly spread and in a few years was everywhere. The Chamberlain forceps was a fenestrated blade, without pelvic curve. The handles were about the length of the blades and curved around like

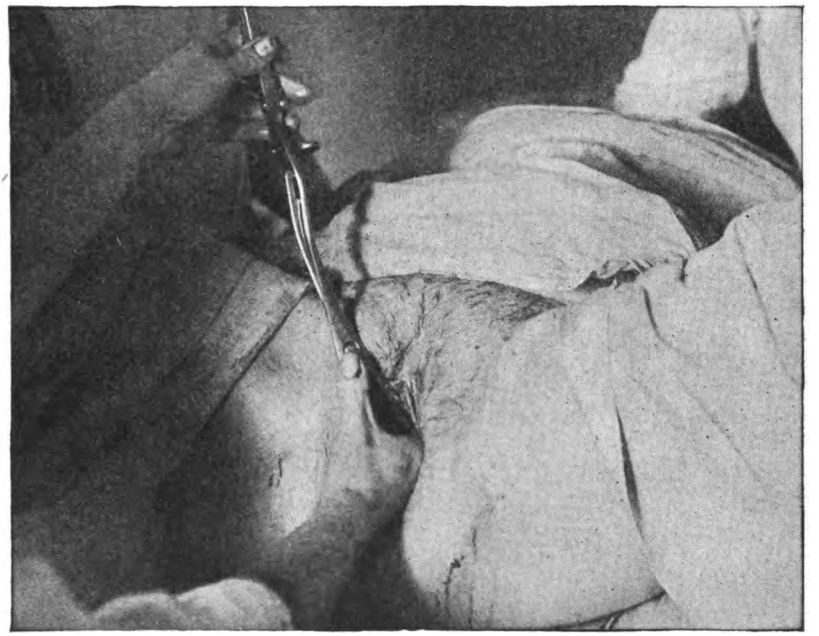


Fig. 86.—Introduction of Left Blade. (GRANDIN AND JARMAN.)

scissors. The blade and fenestra were not essentially different from the forceps of to-day, but were only useful at the inferior strait. The lock was a hole with a tape run through and tied. In 1813, in a secret apartment of the old home of the Chamberlains, Woodham Essex, a chest was found, while remodeling the ceiling, and in it were three pairs of forceps, the originals used by the three Chamberlains. The commercialism of these men has justly been condemned by our profession, and a name that would otherwise have deserved the blessings of mankind has remained famous without honor; nor are we entirely without examples of the same spirit to-day.

There are passages in Avicenna (980-1037) and other Arabian physicians that have been distorted into showing a knowledge of the principles of the forceps, but it could not have been the instrument as we have it to-day. Nor is it probable that the instrument found at Pompeii was intended for the extraction of the living child. Jacob Ruoff, in 1524, used a forceps on the living child, but there was no lock and it was of limited service.

The essential parts of a forceps are the toe, heel, clam or blade, fenestra, lock, shank, handle, pelvic curve, and perineal curve. The

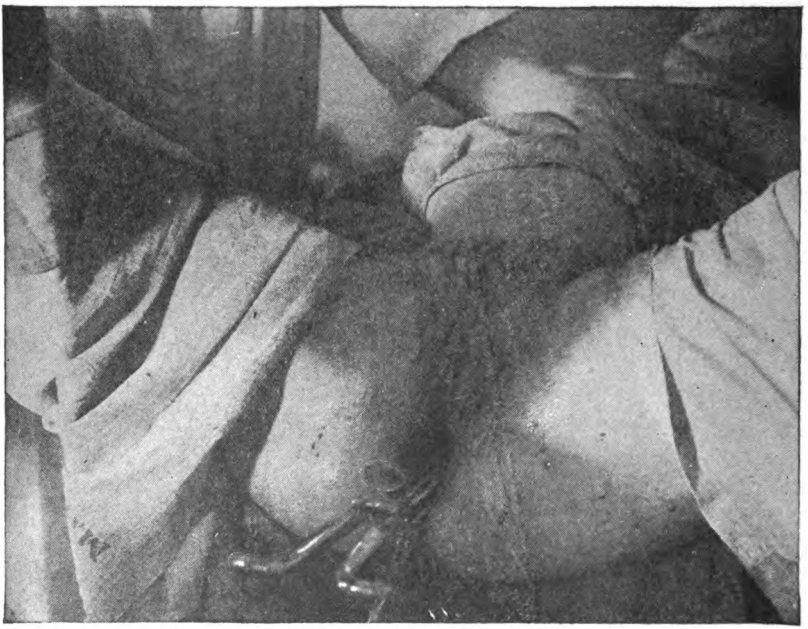


Fig. 87.—Axis-traction Forceps (Faulty Traction). (GRANDIN AND JARMAN.)

lock, after undergoing changes, has settled into three types: French, English, and German. The German is a combination of the French and English.

The forceps is named from the handles, not the blade, so that the left blade is really on the right side. The pelvic curve was invented almost simultaneously in England by Smillie and in France by Leveret, in 1747-50. This bent the clam on a circle of seven-inch radius—the curve of Carus. Another principle was added by Tarnier, the axis traction, invented by one Hermann. The straight

handle is necessary to apply the forceps, but is not a pull in the line of the blade, and by dropping down a handle Tarnier evolved a new principle of great value.

The actions of the forceps are as follows:—

1. A tractor, to aid pains.
2. Compressure of head.
3. Rotator.
4. Lever.
5. Oxytoxic.

1. The great use of the forceps is as a tractor. It replaces a failure of *"vis a tergo"* by a *"vis a fronto."* These forces are identical when properly applied on the same line. The force used must be in the correct axis of the strait, follow its curve exactly, and not exceed normal force, which is about seventy to eighty pounds.

2. Compression is of necessity present, to give a firm grip to the blade. This action is a secondary one, and the forceps should never be applied merely to compress the head. Its freedom from harm to the head depends on the correctness of the curve and the accutacy with which it is applied. A fenestrated blade is better than a solid, because it more nearly conforms to the head and will give a firm grip with the least compression. A good forceps will not close on the head to a danger point, unless at the toe, which must be clear over the head.

3. Rotation is not a safe use, even in the hands of an expert and when the exact position of the head is recognized. This feature is entirely ignored in the axis traction. Left alone, the head will conform to the planes and perineum and be thereby rotated without effort. I firmly believe that those gentlemen who still use the forceps in attempts at rotation are wrong.

4. As a lever, it is properly used if the pelvis wall be not used as a fulcrum. The opposite blade is to be used as a fulcrum, and only the give in the lock taken up. This slight swaying motion that does not move the handles more than an inch to either side of the median line will aid in working the head down exactly as a barrel can be worked through a tight door by side to side motion when it could not be pushed. It would be absolutely pernicious to work the handles up or down, using the symphysis as a fulcrum. This force must be put on at the lock by the hand alone. The harder the pull, the less swing can be safely used.

5. The oxytoxic action is purely secondary, but well marked. The mere presence of the forceps may set up uterine action, but a

little traction is sure to do so. Often all that is needed is to exert a little pull, when a pain will be set up thereby and the handles can be loosened. This can and should be done regularly by the watch about every three minutes, as near as may be, likening the course of normal labor.

The forceps is conservative and preservative. They save injury and they save life in competent hands, but are very dangerous in the hands of the ignorant. They are never to be applied except when

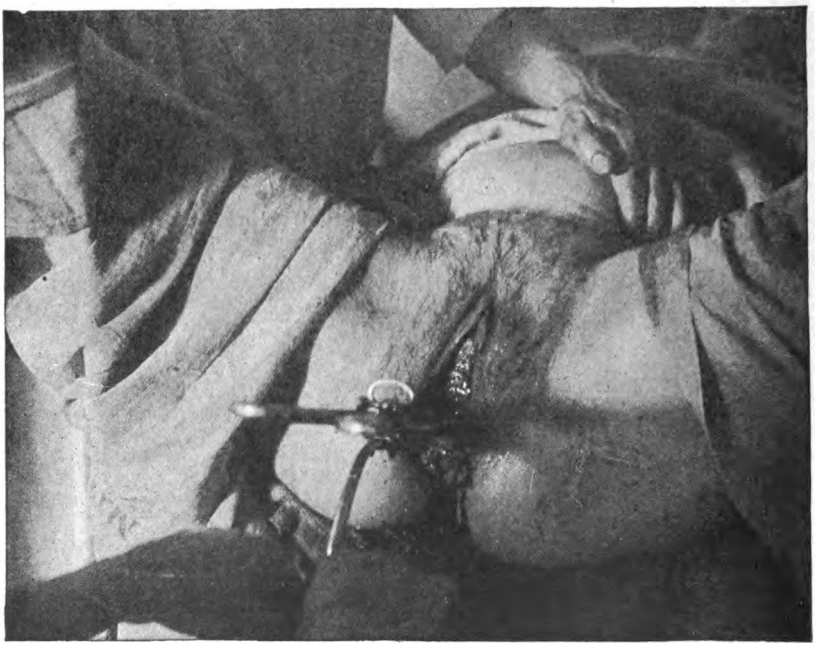


Fig. 88.—Axis-traction Forceps (Correct Traction.) (GRANDIN AND JARMAN.)

plainly indicated, or within a hospital and for instruction. They are, above all, the child's instrument. If you will never use them for the mother, but only when the baby is benefited thereby, which really includes any dangerous condition of the mother, then you are not far wrong. I view with horror any application to shorten thereby the length of labor for the conveniences of the physician himself.

They are absolutely never to be put on any part of the child but the head, never under any circumstances on the pelvis, and the position of the head must be exactly known beforehand.

They must never be put on until the cervix is fully dilated and the membranes ruptured.

Indications.—There must be present a head and pelvis so related in size as to make birth possible, and the head must be engaged, or at least presenting at the superior strait. They are indicated and should be used after there has been a delay of two hours without advance of the head. After this time there will occur either uterine inertia or a condition leading to the formation of Bandl's ring and

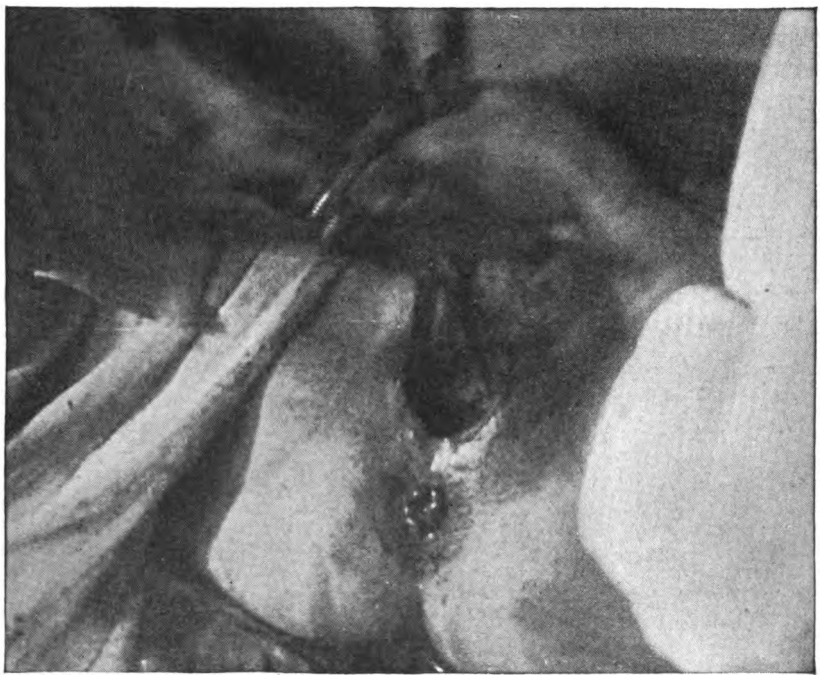


Fig. 89.—Delivery at Outlet with Axis-traction Forceps. (GRANDIN AND JARMAN.)

incipient rupture. The most important cause calling for them is uterine inertia or when the mother's pulse and temperature rise above normal from exhaustion. Almost the same condition, due to valvular disease of the heart, may require them, to save the woman the strain on that organ. Any condition demanding immediate delivery is a positive indication, as eclampsia, death of the mother, detachment of the placenta, etc. When the labor has been long and the child is suffering as shown by a fœtal heart down to 100 or the passage of meconium, which means a relaxation of the sphincter from cerebral inhi-

bition, generally some interference with circulation, then is a call for their use at once. The child is dying and must be taken away.

In emergency cases time must be taken to dilate the cervix, or the forceps cannot be applied and the membranes must be ruptured artificially. They are, of course, positively not to be used at the mere request of the woman to shorten her suffering, or to shorten the stay of the physician, nor in pelvic deformities, or faulty presentation, or

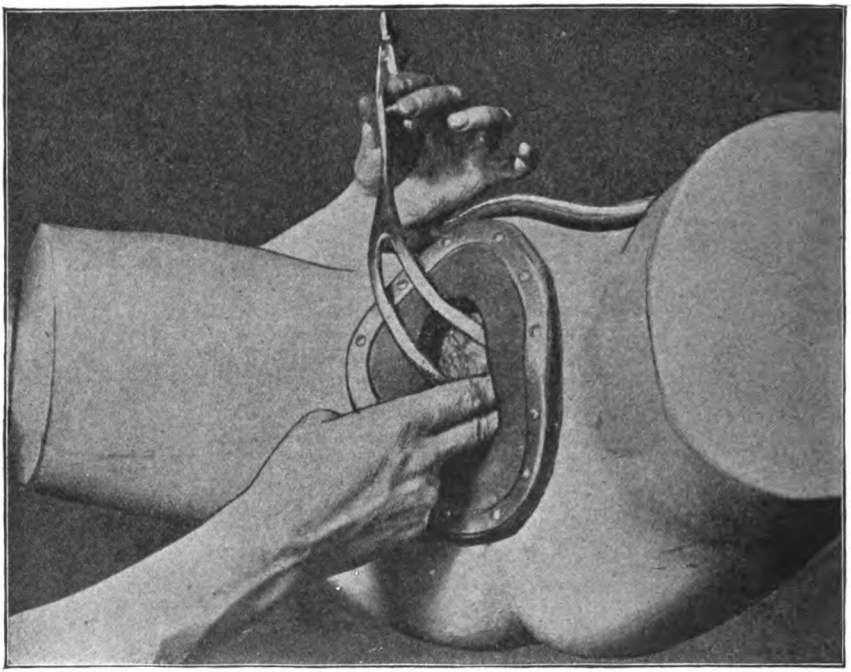


Fig. 90.—Introduction of the Left Blade of the Strait Forceps. (GRANDIN AND JARMAN.)

hydrocephalous or acephalous, or relative difference in size—conditions rendering labor *per via naturalis* impossible.

Authorities differ in regard to the proportion of cases in which they are used. The Rotunda Hospital, covering seven years under Purefoy, 1886-1893, showed them used once in every 33 births, or 3 per cent. of all cases. I should judge them used with about the same frequency under Dr. Tweedy, the present master. The increasing strain and unhygienic modes of living of our American women are raising the percentage with every generation. Almost every case I

have had in women of wealth for two generations has required their use.

Preparation of Patient.—1. The bladder and rectum must be emptied as at birth. Right here I want to stop and insist on its being a fast rule of conduct to have a catheter placed crosswise in every roll of instruments. It must be the regular and invariable rule to draw off the urine before each and every operation. Simple as this should be, every operator will bear me out in stating that it is almost impossible to get students and nurses to attend to it.

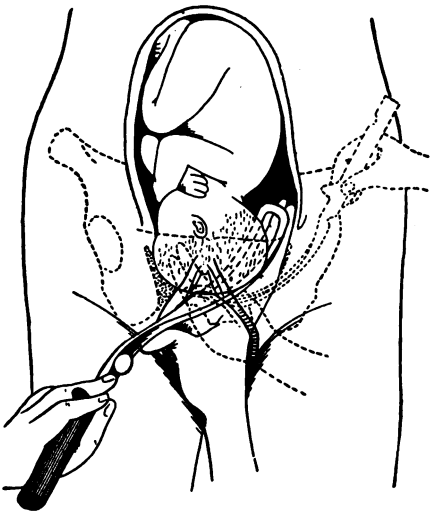


Fig. 91.—Diagram Showing the Relationship of Hand, Blade and Head. (GRANDIN AND JARMAN.)

2. Gain the consent of the patient, if possible, or her husband or next of kin, in every case. It is their right to know of it, and their consent will relieve you of responsibility or even a damage suit if an accident happens. A consultant is not needed unless the family wish it.

3. Have at least two helpers present.

4. Shave vulva, clip mons, and douche the vulva and field of operation, and cover with towels.

5. Hands and instruments must be aseptic, and no oil or grease, not even carbolized vaseline, is to be used. It is not needed, especially if lysol solution is used for immersing the forceps.

6. Place the woman in the lithotomy position, well over the table or bed, on a Kelly pad.

7. Have her knees held apart by your assistants, and supported.

8. The use of chloroform is not needed except when the woman is very hysterical. It is far better not to use it. There is no pain, and this assurance will usually suffice.

Application of Forceps.—1. Sit down in front of patient and insert right hand and feel for the ear, or at least the side of the head, within the cervix.

2. Take the left blade in the left hand, holding it as a pen (the handle will incline to the left side) and allow the toe to slide up the palm of the right hand as a guide, in the curve of Carus.

3. Be careful not to let the toe leave the palm; the fingers must be within the os, and this must be pressed out with the back of the fingers to make room for the blade between the hand and the head. You are to remember that the left hand is to put on the left blade on the left side of the mother, and the right hand the right blade on the right side. A formula to aid in memory is that governing the nerve-exits in the head, "right back," or the right always is last; so here "right back" the right blade is the last to apply. The right blade is to be applied exactly as the left, the handle of which is dropped or supported by an assistant.

4. The blades are not symmetrical and will not lock. The next step is to gently rotate the blades until they slide into the lock without effort. No force is to be used, and if they cannot be gently locked there is something wrong, and they must be taken off and reapplied.

5. The direction of the handles tells the obliquity of the head.

6. Now, before exerting traction (and here is where the value of not giving chloroform comes in) squeeze the handles. It may be that some maternal part, cervix, vagina, or vulva, may be caught in the locking; if so, the woman will tell you she is being pinched, and you can rearrange. I have known bad tears from this when the woman was narcotized.

7. Make firm traction, to see that the forceps will not slip. If they do, take them off and reapply.

The reason forceps slip will be:—

1. Improper application, in which case the handles are often widely apart.

2. A failure to sweep the toe clear over the head so that the head is in the fenestra, and because of this danger no force should be used to lock blades.

3. Some vicious position not recognized before and which the ear, if it can be felt, will prevent you from making. The fingers of the hand not used in traction should be extended over the lock, their tip on the child's scalp to note any tendency to slip. It is possible sometimes to feel the blades through thin abdominal walls and thus materially assist in knowing that they are applied correctly. The applications of the forceps are termed high, medium, and low, accordingly as they are placed above the inlet, in the excavation, or at the outlet. They are almost always required at the inlet, or high.

Their Use.—Now having the forceps properly applied, locked, and tested for pinching and slipping, you are:—

1. To pull in the axis of the strait which transcribes the curve

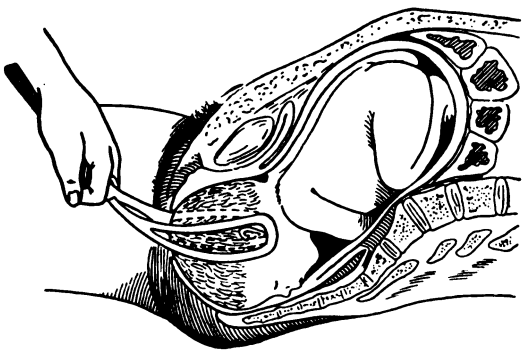


Fig. 92.—Correct Application of Low Forceps. (GRANDIN AND JARMAN.)

of Carus. In high forceps the axis is from umbilicus to coccyx, and you cannot pull too far backward. If the woman is on a table, it is in a line to your feet at the superior, your waist at the excavation, and your face at the birth.

2. If the woman is having pains, you are to wait for the beginning of a pain and only pull during about three-fourths of a minute. If she has none, you are to liken them by traction every three minutes for forty-five seconds. If she has a pain and you will note the direction that the handles move, that is the direction for you to pull.

3. Take plenty of time. Once on, the forceps give you absolute mastery of the situation. Use at least a half hour to accomplish delivery when nothing demands speed. Too sudden emptying of the womb has many dangers as failure to contract and hæmorrhage. Approximate the normal.

4. Even if labor starts up normally, never take off the forceps until the head is born. It is of great value to hold back the head when the perineum is reached.

5. If there is any locking device of the handles, see that all compression is relaxed between pains. This is the only time that the circulation in the child's brain can be maintained, and it must not be continuously compressed.

6. In straight forceps, get the force in the line of the axis by downward pressure on the lock with the hand not used in traction. The resultant of your pull and pressure must approximate the axis.

7. A slight rocking motion will aid descent, but must not be too wide—two inches at the outside.

8. If any but axis traction are used, the rotation must be allowed for.

9. Never brace against the bed and pull, or exert more than seventy pounds of force. This is easily done with the arms alone, and is not tiring with the rest that should be given. This seventy pounds of force is about equal to what would lift the hips of a woman from the bed. I could cite many ludicrous and yet pitiful efforts of men to deliver by traction in the wrong axis.

10. As the perineum is reached, slacken the pull, or even hold back the head, but in all events hold it well up against the symphysis.

RULES IN SPECIAL CONDITIONS.

1. There is one position of the head—R.O.P.—where the rule of applying the left blade first will usually have to be departed from. This is especially true if there be any departure from perfect flexion, and there usually is. In this case, the left blade being in position, the handles are to the left in exaggerated position, and there is no room to apply the right blade and lock. It is usually best to apply the right blade first and partially withdraw it, depressing the handle; the left is then applied and the two blades rotated into position.

2. In transverse positions the blades must be placed obliquely on the head rather than squarely over the face. This will tend to disengage the head from its vicious position to an occiput anterior, either right or left.

3. On the continent the tendency is to apply the forceps to the side of the head, regardless of the pelvic curve, lest the face be injured. In England and America they are applied regardless of the head, but to the sides of the pelvis. The views in England and the continent have exactly changed places during the last century. I feel

that the forceps should never be applied regardless of the essential pelvic curve upon which it is constructed, and do not think the injury to the face will be as great by the forceps as by efforts to drag through or attempts to rotate a transverse head. In fact, the posterior blade would bridge the sacrum and prevent descent. A certain obliquity can be obtained in these cases without slipping and without ignoring the pelvic curve, and the head is thereby coaxed into place. With each pain the forceps should be readjusted after unlocking, thus giving a free opportunity for the head to change.

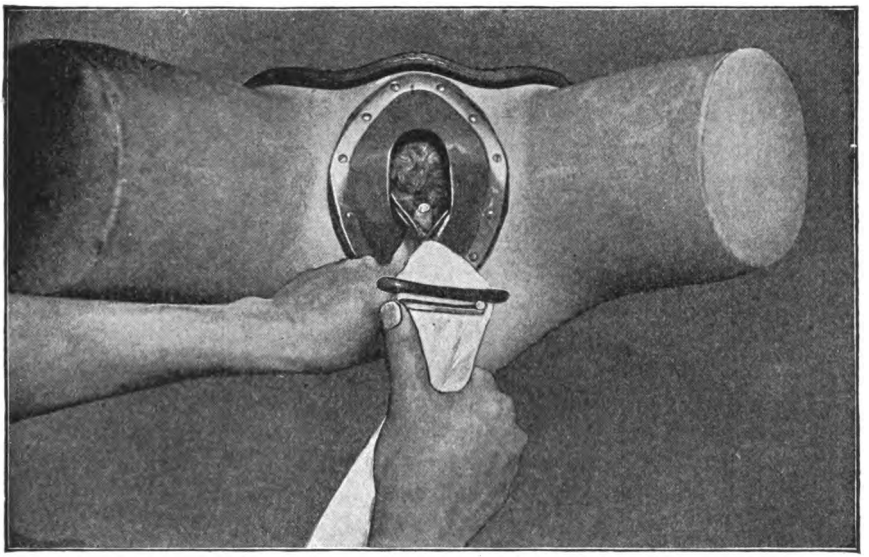


Fig. 93.—Towel Applied to Handle of Strait Forceps. (GRANDIN AND JARMAN.)

4. In all occipito-posterior positions this last is important, and the transverse is by me considered merely as a tendency to the posterior. It has been shown how normally and regularly the head entering posteriorly will rotate to the front. Lest any efforts of traction should counteract this, the blades are to be unlocked after each pain and readjusted rather late in the pain, relocked, and traction applied. With this done the head is free to follow its own rotation, and traction is only put on to assist the strength of the pain. Naturally, in axis traction this is not necessary to be considerd.

5. In a persistent posterior the curve of Carus is to be followed

until the occiput is born, when the handles must be depressed to sweep the face from under the symphysis.

6. In cases of anterior asynclitism, Litzmann's obliquity, or the presentation of the posterior parietal in a flat pelvis, it would be positively wrong to attempt delivery by forceps, because the line of traction on the forceps is forward and not backward and will only result in further locking the head or displacing it. Here version is indicated. In the Naegele or anterior parietal presentation, on the other hand, the forceps is the treatment par excellence if the head can be passed at all.

There is a method of applying forceps that was advocated by the late Dr. Tucker, of Sloane Maternity, which differs from that usually taught. It is best done with the now nearly obsolete solid blade, but is worth remembering. It is only applicable at the superior strait. The left blade is passed almost in the median line, just anterior to the sacro-iliac joint and following the curve of the sacrum. The right blade is made to follow the left as a guide, but with its tip to the right side of the mother. Both blades are in the hollow of the sacrum, with their tips in opposite directions. The blades are then made to sweep over the head into position, when they lock. These blades are not equally rotated. In L.O.A. the right blade is almost in position, while the left sweeps over considerable of an arc.

In posterior and transverse positions the head is never flexed normally. The forceps cannot, therefore, be applied to the long diameter of the head as they should be; and as such heads are high up, the tendency is to grasp the head with the toe rather than get above it. The blades are wide apart, and this fact gives a poor tractor, for the planes of the blades are more nearly parallel and do not grasp around the head. Attempt to correct this by rotating the blades is to invite disaster. The curve from toe to handle is too great to turn safely in the canal, *i.e.*, the chord of the arc is greater than the canal width. But this does not prevent slight efforts, usually sufficient, with each pain the forceps being readjusted constantly and holding, as it were, what is gained from time to time. In other words, be very cautious and deliberate in your efforts of rotation, and, remembering that it does not occur until in the excavation and by the pelvic floor, put this rotation force on late, when the traction is directly anterior and the blades are low. You cannot injure the child with pressure by the clam if the forceps is of correct model; but if the edge or toe be pressing the head, it can easily be depressed. It is the poorly adjusted forceps that injures.

The ideal use of the forceps would be to use axis traction until the floor is reached, and then take it off and rotate, or follow rotation with the direct or even produce it. For this reason I am partial to the Cole forceps. It is correct in shape and thin in shank, and its perineal curve admits of nearly axis traction, at least parallel with it. The perineal curve makes it easy to apply, and it will go very high without pressure back on the perineum.

The forceps always presupposes a possibility of practically normal delivery except for a loss of uterine force. It is not an operative procedure for pelvic deformity, and its use must be in cases where the true internal conjugate is not under 3½ inches (9 centimeters); below this, forceps cannot avail much and must not be attempted.

To sum up, they are used:—

During first stage very rarely indeed; in cases possibly of rigid cervix, placenta prævia, or loss of amnion.

During the second stage the great cause is uterine inertia, a small vagina or rigidity of parts, a large head or slight deformity, or want of flexion; summed up as a disproportion between the force available and the resistance in front.

In accidents, to effect immediate delivery: eclampsia, prolapse of cord, incipient rupture of womb, or to retard the head at the perineum. In rare cases, after rupture, to get the child.

CHAPTER XXII.

OPERATIVE OBSTETRICS.

VERSION.

THIS is any manœuvre to cause the unengaged child to present either cephalic or caudal pole at the superior strait. It is to make a bad condition a better one, and is usually changing a transverse or head into a podalic presentation. There can be but four primary modes of doing this:—

1. Posterial, using gravity.
2. External manipulation.
3. Internal manipulation.
4. A combining of external and internal manipulation.

If the change is to the cephalic pole, it is termed version "by the head"; or caudal "by the breech"; so we could have either of these four by head or breech. Version is very old indeed, well known to even primitive races. The woman herself instinctively will press the abdomen after hours of labor.

The contraindications, being here more important than the indication, will be given first:—

1. If the presenting part is firmly engaged it is positively not to be done, especially if it is out of the cervix.

2. In the presence of Bandl's ring, rupture is imminent and likely to occur if any movements add to the pressure, even the grasping hand.

3. Any condition rendering it dangerous or difficult, as a primipara with rigid parts, hydrocephalus, dry labor with womb contracted on child, spasm of uterus, hysteria, epilepsy, eclampsia, abdominal fat, etc.

There must be no engagement, a soft, yielding womb with plenty of amnia, the os dilated, and womb not irritable. It is positively indicated in brow, face, and shoulder presentations, and in more frankly transverse positions when these conditions are present rendering it possible.

It is indicated when:—

1. Requiring rapid delivery.
   - Hæmorrhage, concealed.
   - Placenta prævia.
   - Eclampsia.
   - Separation of placenta.
   - Rupture of womb.
   - Embolism and death.
2. Endangering child.
   - Face and brow presentations.
   - Prolapse of cord.
   - Prolapse of arm or foot and hand.
3. Rendering aid a necessity.
   - Uterine inertia.
   - Large head.
   - Bandl's ring forming.
   - Rigid parts.
   - Pelvic deformity.
   - Transverse presentations.

Only in death, hæmorrhage from separation, and eclampsia is rapid delivery required. In placenta prævia it is its own tampon. It is very rare indeed that it would be justified in case of Bandl's ring, and then before it was actually present. In pelvic deformity and large head it would be proper in cases of slight discrepancy, capable of passing the base, and on the principle that a ductile body can be drawn through what it cannot pass by pushing. If attempts at forceps have failed, it is certain that version will not deliver and something else must be done, for a retention ring is probably present.

But little force can safely be put on the neck, and unless a finger can be placed in the mouth no great force should be applied lest birth palsy result—an accident by no means rare. It must be known to a certainty that the head can pass, and the contraction must not be under 8 centimeters. What the Walcher position will not do in the presence of strong pains, will be unsafe in version.

The two postural versions can be dismissed as rarely being of any use. External version is a little better. The child may be straightened and will have to be held in place by pads and bandages, or it will relapse into its vicious position. External cephalic is very slow and useless unless the forceps are to be at once put on. It is best in the week prior to labor; but the constant factor of deformity or vice of position will require padding and binding until the head engages.

External podalic is even more rarely indicated or useful. In a lack of flexion of the head, recognized early before labor, it might be worth a trial.

The internal cephalic is rarely possible and is much harder than internal podalic. In theory, cephalic is better than podalic, but its difficulty is prohibitive. The head would have to be very small, as the hand and head are larger than the inlet. The shoulder must be pushed up and the hand swept over the head, levering it into position.

Internal podalic is the only useful method, except the best of all soon to be described. It is very old, known to the Romans and revised by Ambrose Paré. It gives a quick, immediate delivery in emergencies and mild contractions. Every aseptic precaution should be used and the patient anæsthetized, to relax the parts rather than for the pain. The woman should be placed on her side toward which the feet point, so that they will be as low as possible, unless they are low, when the lithotomy position is better. The bladder and rectum must be empty. The hand, the palmar surface of which points to the child's belly, is the one to use, extended as in shaking hands. This hand, well lubricated, fingers together, forming a cone, is steadily pushed up into the womb. Gloves are a great advantage, from the ease with which they slip. If the membranes are intact, they must be ruptured and the cervix dilated. If a pain comes on, the hand is to be extended and left inert until it passes. One should work up easily, and never by a boring or twisting motion. The main thing is to take plenty of time and go high enough to get a foot. Despite the decisions as to which foot to grasp, I believe it best to take the first one, or both if they lie together. The anterior is the most favorable and can be caught usually between two fingers and brought down. In getting the foot down, the thigh must be flexed or the femur may be fractured. The foot or feet should be dragged down until the knee is at the vulva, when a fillet is put on and the rest usually left to nature. It is now a breech case. If one leg is up, it is a good dilator although your hand has already prepared the parts. Occasionally, in version as in breech cases, the extended arm may give trouble. Some of this danger may be prevented by bringing down an arm or arms into the vagina, if possible, before the feet are seized. The pressure of the uterus makes it very hard for any part once out to get back in again.

Combined cephalic is of little, if any, utility, but the combined podalic, first recommended by Hohl, or the Braxton-Hicks is better even than internal podalic. The same description applies to both. In this last the other hand is used to push up the head. When this is done first, the feet will be found at, or very near, the cervix, and the whole hand does not enter the womb. It is the best and surest of all versions. Naturally the leg that tends to bring the occiput under the

pubes is the most desirable, and this choice can be exercised in a Braxton-Hicks, where it could not be in simple internal podalic. In either of these, if the foot is out of reach the leg or knee is just as effective. As in forceps, the foot is only to be pulled upon in the presence of a pain. Unless in a hurry to deliver, when the knee is out it is a normal breech and needs nothing more. If one foot is up,

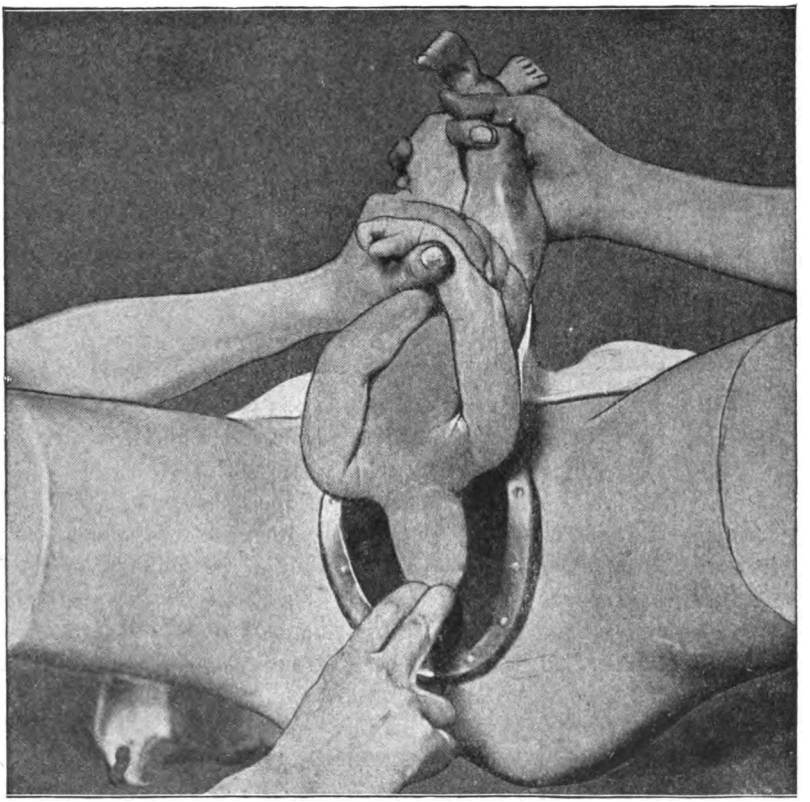


Fig. 94.—Delivery of the Head. Admitting Air that the Child may Breathe. (GRANDIN AND JARMAN.)

it protects the cord. No confusion ought to arise as to the foot if it is remembered that the elbow points to the breech, the knee to the head; the toes are of equal length, while the fingers are not; and the thumb is at right angles to the hand. Should the cord be around a limb, it must be disengaged. A great mistake is being in a hurry, and a second is not to go high enough and so waste time feeling

around. Get the foot and get it down; if it is not the right one, slip on a fillet and get the right one. The near foot is best in dorso-anterior, the remote in dorso-posterior, and one foot is better than both as a rule.

EXTRACTION OF THE HEAD IN BREECH.

The method of Smillie is to place the child's belly on one arm, with one or two fingers in the mouth or on the chin, while the fingers of the other hand push up the occiput.

Wigaud-Martin is the same, except that down pressure is made from above.

Mauriceau's method has two fingers in the mouth and the pressure is over the neck and clavicles.

The Prague method has the finger over the clavicles, but the feet are grasped and lifted by the other hand.

Deventer's is the same as above, except that the body is dropped and the head delivered occiput first in flexion.

SYMPHYSEOTOMY.

The rami have been cut on either side of the symphysis, rami and symphysis, rami of ischii, and pubes on both sides, etc., to gain room. These are curiosities and not recognized procedures.

Symphyseotomy is an operation to enlarge the inlet of the pelvis by cutting the cartilage at the symphysis pubis and separating the iliæ. It may be done alone or as an adjuvant, or preliminary to some other procedure, as forceps, version, etc. No course is complete without a knowledge of it, and it should not be condemned unheard; but I do not consider that it has any place in obstetrics. This operation has had a peculiar history, being enthusiastically taken up about once in each generation and being as suddenly dropped, as a new set of men learn its long list of disastrous consequences.

It was first suggested by Jean Claude de la Courvèe, a French physician in Warsaw, in 1598. In 1644 he performed it in a dying woman and saved the child. Then it was forgotten. In 1766 Joseph Jacques Plunek, in Hungary, operated in the same way and saved the child. Two years later (1768) a French student, Jean Rene Sigault, of Paris, made it the subject of his graduation thesis and urged it upon the living woman. In 1774, six years later, it was done on a living woman at Naples by Domenio Farrara, a pupil of Sigault, but the woman died. In 1777 Sigault did it in Paris. Both mother and child lived, the former with a vesico-vaginal fistula and never after

was able to walk. At this time section was uniformly fatal, and even with this end the result was considered brilliant. It was enthusiastically done in no less than 35 cases between 1777 and 1787, but with uniformly bad results.

From 1787 to 1858 some 21 operations were done, mostly in Italy, where it was remembered. In 1866 a new revival began. Prior to 1866 Harris, of Philadelphia, could only find 100 recorded cases in all literature, having a maternal mortality of 31 per cent. and fœtal of 65 per cent. In January, 1866, Ottavio Morrisani, in Naples, saved both mother and child. For twenty-five years, *i.e.*, until 1878, Morrisani and his pupils did some 71 operations, with a maternal mortality of 25 per cent. From 1878 to 1891 there were 24 operations, all in Italy.

In January, 1892, Spinelli published a history of these 24 cases, and another revival began. In February, 1892, Pinaud, of Paris,

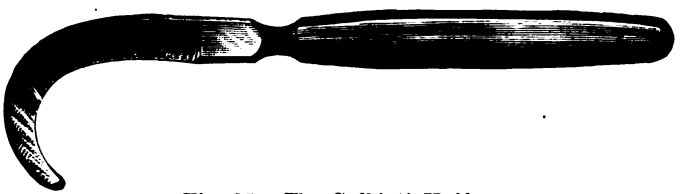


Fig. 95.—The Galbiati Knife.

operated, and did 19 the same year. In September, 1892, Harris, of Philadelphia, read a paper on this new operation, and September 30th, Jewett, of New York, performed the first operation in the western hemisphere, followed a few days later by Hirst, of Philadelphia. It had a run in the United States for about six years, and has again gone into hibernation.

The mortality is somewhat unsettled. Morrisani, in his first 50 cases, lost 20 per cent. Pinaud admits 11 per cent. Of 210 cases since 1886, *i.e.*, with aseptic methods, the maternal mortality was 12.85 per cent., fœtal 20.2 per cent. The first 72 operations in the United States gave 14 per cent. and 26 per cent. At Baudelocque's clinic, from 1892 to 1894, in 49 cases, the mortality was 8 per cent. and 10 per cent.; yet Zweifel, with 31, Bar with 23, and Küstner with 7, report no deaths. A late series of American cases gave 12.7 per cent. and 35.5 per cent. It is safe to sum it up as having a mortality in the hands of a fair surgeon, in good surroundings and favorable cases, of 12 per cent. to 14 per cent. to the mother and 20 per cent.

to 25 per cent. to the child. Many, if not all, children require resuscitation and are often still-born.

The separation occurs by a combination of three acts:—

1. Movement of the pubes outward by rotation of the innominate bones on a vertical axis through the sacro-iliac joints.

2. Rotation of the bones on a transverse horizontal axis, carrying the pubes downward.

3. Rotation of each iliac on its own axis, so as to become more erect and vertical, the crests even approaching each other.

It is in reality an exaggerated Walcher position.

The extreme limit that the symphysis must be allowed to separate is 7 centimeters (2¾ inches), which rarely gives over ½ centimeter (1/5 inch) to the true conjugate. The sacro-iliac ligaments will rupture on separation of from 4 to 9 centimeters, but when softened by pregnancy 7 centimeters may be considered the limit. This will increase the conjugate vera ½ centimeter (1/5 inch), the transverse 2 centimeters (¾ inch), and the oblique 2½ centimeters (1 inch). The occipital prominence will project between the separated bones about 1 centimeter (2/5 inch), so that we increase the conjugate vera 2 centimeters (¾ inch). In general, for every one inch of gap (2½ centimeters) there is ½ centimeter (¼ inch) added to the true conjugate. The actual method of operating varies a little. Morrisani cuts down to the upper border of the pubes and passes a Galbiati knife behind and downward, then cuts up and forward. Pinaud cuts to the joint in front, but nearly always injures the vessels of the clitoris. The American operators usually do what is called a subcutaneous operation. Following whatever method is used, the delivery also varies a little. Zweifel waits twelve hours for normal labor. Morrisani uses forceps in one-fourth of his cases, and Garrigues always and at once.

The woman is prepared by shaving and sterilizing, and bladder and rectum washed out. The symphysis is often marked by a slight depression and occasionally motion. It is rarely in the exact median line.

In the Morrisani operation a transverse incision 3 centimeters long is made 1 centimeter above the bone, exposing its border. The finger is passed behind and the urethra pushed to one side by a sound. A Galbiati knife is passed and a cut is made up and forward. The skin is stitched and a plaster spica bandage applied.

Pinaud cuts from 8 to 10 centimeters in the center line from above the bone to clitoris. The recti are separated and a finger placed

behind. The union is cut from above downward, the subpubic ligament last.

The American plan: Hold the urethra to one side. Puncture a little above the arch and under the elevated clitoris. The left first finger in vagina is held back of the joint. A tenotomy knife is passed up close to this bone, emerging just above the symphysis and in the median line. A probe-pointed bistoury is substituted and meets the vaginal finger and is drawn down until the union is felt to give.

Fig. 96.—Showing Relation of Adjacent Structures to Symphysis. *A*, Vessels of the Clitoris; *S*, Symphisis Pubis; *B*, Bulbi Vestibuli; *C*, Amnion; *D*, Bladder—Higher than Usual; *P*, Peritoneum; *H*, Anterior Lip of Cervix. (GRANDIN AND JARMAN.)

The subpubic ligament must be cut at the time of the operation, or it will tear off suddenly and lacerate the vaginal vault. The pelvis must be held by a firm lashing or sling of canvas which will absolutely prevent too wide a separation, and after delivery the bladder must be pushed back or it will be caught between the bones. The knees are bound and the bones held firmly together, and it is safest to keep the woman in a sling or hammock for forty days. Lateral

pads to prevent rocking are not so good. Wiring and suturing has not been satisfactory.

The operation may be complicated by excessive fat hiding the landmarks, a bulging of womb over the symphysis, ossification of the joint, and the latter is rarely in the median line. The procedure may be very simple or extremely complex. The operation abounds in accidents and postpartum complications; 30 per cent. have sepsis, mild or severe. Great injury to soft parts is the rule, and even when the woman recovers she is often crippled for life. Some of the following observed consequences are certain to happen: hæmatoma, abscess, vesico-vaginal fistula, cystitis, lymphangitis, incontinence of urine, paralysis of bladder, bed-sores, myelitis, neuralgia, sacro-iliac arthritis or suppuration, caries, laceration of clitoris, vagina, corpora cavernosa or bladder, permanent inability to walk, sequestra of bone, general sepsis (33 per cent.), prolapse of bladder and womb, great hæmorrhage from torn veins, or persistent pain. In no case is a second child born normally. There are always cicatrices and contractions. The stay in bed will be from five weeks to ten months, and there is some play (1 to 3 centimeters) at the symphysis in favorable cases.

Morrisani claimed for symphyseotomy a well-defined place between premature labor and section, between 8.8 centimeters and 6.7 centimeters (3.46 and 2.64 inches). In general, nothing can pass below 5 centimeters (2 inches); between 5 centimeters and 8 centimeters (2 and 3¾ inches) a dead and crushed child can pass; below 8 centimeters (3¼ inches) no living child can pass.

The lowest limit of version is 8½ centimeters (3¾ inches), which, with a Walcher giving 3 centimeters (¾ inch), would be 8 centimeters (3 inches). This operation, then, can never be a rival of version, only of section. Now section is required below 6 centimeters (2½ inches). Between 6 centimeters and 8½ centimeters (2½ and 3 inches)—a very small margin indeed—do they overlap. Section has a lower mortality (8 per cent.) than symphyseotomy (11 per cent.), and is easier to perform. I should certainly say if version was not possible then the next step is section. If the child is dead, then cranioclasm. I can see no place for this operation.

HEBOTOMY.

Some ten years ago, because of the dangers of symphyseotomy, Gigli devised a cutting of the pelvis by a special saw, just to one side of the symphysis. Bauereisen, December 19, 1905, reports 107 cases of this operation, modified a little by nearly every operator, with a

very low mortality, 4 per cent. While the dangers of separation are the same, the one is opening a joint, the other is a resection of bone, which readily heals and leaves no mobility. Being to one side, the clitoris and urethra are reasonably free from wounding. It is even claimed that the pelvis is left permanently larger after the operation from the resulting callus between the ends; they also urge no attempt at union of the ends in order to gain this very result.

The best method is that of Walcher, who cuts the pubes subcutaneously by two slight punctures, easily sealed with collodion, and passes a blunt needle to carry a saw. The needle is passed upward from the labium majora, internal to the crest of the clitoris, and avoids the great hæmorrhages when this is wounded. Williams and others cut down to the bone, and the latter uses a copper sound to follow the bone and prepare the way for the saw.

CÆSAREAN SECTION.

Cæsarean section, or laparo-hysterotomy, is the removal of the child by an incision through the abdomen and womb. It is derived from *Caeso matris utero,* not from the myth that Julius Cæsar was so delivered. The law of Numa Pompilius made it compulsory to cut open every woman dying late in pregnancy. This procedure has never been lost sight of even during the Renaissance. The first successful case was by Jacob Nufer, in 1500, on his own wife. F. Rausset, in 1581, reported nine doubtful cases. Sutures were first put in the womb by Lebos in 1769 and was severely criticized by Smillie, Leveret, Velpeau, and Baudelocque.

Hippocrates, Galen, Celsus, Arietæus, and others mention section, but probably only on the dying woman. There are many scattered instances of it, however, that would indicate that it was a recognized procedure on the living. The operation has been depicted in Roman sculpture. Æsculapius is said to have been so delivered; Bacchus, from Semele; one of the kings of Navarre; Andrea Doria, doge of Venice; Pope Gregory XIV, Robert II of Scotland, and Jane Seymour, wife of Edward VI. These show a familiarity at various times and in widely separated localities. Section has been done repeatedly on the same woman, Michaelis, of Kiel, so delivering a woman in 1826, 1830, 1832, and 1836. Filkin even knew of its being done in native tribes of Africa. Women have performed it on themselves, as well as suffering it from cannon-balls, horns of cattle, etc. The child can be saved for a considerable time, too, after the death of the mother, as late as two hours in one case; Tarnier so delivered

a living child three-fourths of an hour, and Playfair one-half hour. In Macbeth, act V, scene VII, occurs the passage, "and let the angel whom thou hast served tell thee, Macduff was from his mother's womb untimely ripped"; act IV, scene I, "for none of woman born shall harm Macbeth."

In preaseptic days it was practically death to the mother from sepsis and hæmorrhage, and was condemned by Parè and Mauriceau. Even up to 1876, when Edward Porro described his pan-hysterectomy, the mortality was 66 per cent. Before his time the womb proper was not sutured, as it was thought that uterine action would tear out the sutures.

The modern operation is essentially that first announced by Sänger, of Leipsic, in 1882. The three factors of aseptic technique, careful suturing, and early operation have reduced the mortality from 66 per cent. of mothers and many children to 10 per cent. of mothers and 5 per cent. of children. It is as safe to the mother as craniotomy, and saves the child. The tearful and intense appeal of R. Beverly Cole—my preceptor and predecessor, of beloved memory—against the soul-damning operation of child-murder need not be uttered to-day. While 10 per cent. may be taken for the mortality of all cases, it is much less when the case has been carefully supervised. The majority are among the poor and rachitic, under the care of a mid-wife it may be for days, until exhausted and septic. A neighboring physician is then called, the condition recognized, and the patient rushed to a hospital in the very worst possible shape for any operation. Leopold collected 100 consecutive operations, and in the first 68 has a mortality of 5.8 per cent., and in the last 27 had 3.7 per cent. In uninfected cases the mortality will be under 4 per cent. and no children lost from the operation *per se*.

The Sänger operation is as follows:—

There are two incisions—a long sweep from above the umbilicus to the pubes, and a six- or seven-inch incision below the navel, as in laparotomy. The first is advantageous in rendering the after-steps and the prevention of fluid in the abdomen easier, but leaves a long, unsightly scar, with its danger of stitch abscess and a weakness of the abdominal wall. The next step is to straighten the womb and to bring it up to the opening, and surround the cervix by a rubber tubing, or have the arteries held by the hands of an assistant. The whole field should be surrounded with hot towels, holding the intestines back. Although it is advantageous to know beforehand the position of the placenta, a long median incision is made regardless of it.

This cut should be at least five, better six, inches long. A little device of Munro Cameron has practically done away with the usual sharp hæmorrhage upon incising the womb. He softens a gutta percha pessary until it is flat, and has it pressed down firmly on the womb around the place of incision. This compresses the vessels to a point where this usually bloody step in the operation is almost free from more than an oozing until the child is extracted, when the contraction is sufficient.

It is of positive advantage to find the placenta in front and in the path of the incision, for it is the more easily held and compressed by the hands of the assistant when the child is out.

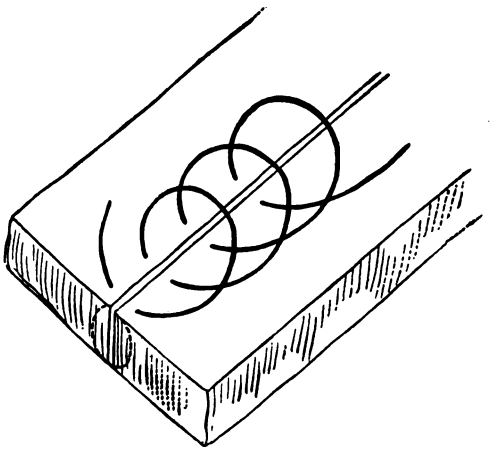


Fig. 97.—Showing Sutures Passed, the Loops Uncut. (GRANDIN AND JARMAN.)

The transverse incision into the womb, advocated by some, is to be condemned. It has been known to rupture, and is crosswise to the line of contraction. If the line is vertical, the womb adheres to the abdominal wall and a second operation will be extraperitoneal, especially if, as sugested by Kelly, the omentum be drawn down behind the womb instead of in front, to wall off the intestines from possible infection.

No time is to be lost in extracting the child by grasping the first part available. It is not necessary, as once thought, to get the head. Uterine hæmorrhage will not stop until contraction occurs, and will begin when the womb is open. The child should be removed with the gush of water if possible, and handed to an assistant, who clamps the cord with artery forceps and cuts between them. The operator then

instantly plunges his hand into the womb, grasps the placenta, and squeezes it as a sponge until it loosens and is removed, when the membranes are stripped off. Hæmorrhage usually ceases at once when the womb is empty. A saline douche is given.

The sutures of heavy gut are in three layers. The first is a through-and-through interrupted suture of the muscularis, about one-half inch apart. The pressure on the arteries should be slackened here and any prominent bleeding parts inclosed. The second set—also interrupted—embrace the uterine peritoneum and bury the first; and lastly a second running stitch is put in the peritoneum over the first. It is important to close the peritoneum over the lower part of the womb, as here is where trouble may occur. It is a disadvantage to dry or dust the interior of the womb. The abdomen is flushed with saline solution and the walls closed as in any laparotomy. Ergotin should be given hypodermically. It is a mistake to constrict the womb with a band too long or too tightly, as it favors paralysis and subsequent hæmorrhage.

As a rule, most operators advise against dilating the cervix, though some dilate and pack. At term it is usually sufficient to insure drainage.

The moment the baby is extracted and the cord cut, it should be taken by a nurse, at once inverted, and means taken to resuscitate it. Often the shock of the cold air before the baby can be extracted is sufficient to cause it to inhale the liquor amnii. The majority of cases will require some persuasion before they cry in the usual vigorous manner.

A failure to breathe on the part of the woman when the abdomen is opened is not a contraindication. The moment the womb is opened and the pressure on the diaphragm relieved she will begin again.

The Porro operation is a removal of the pregnant womb and prevents conception again, but is not required except when all the structures are septic and a total ablation seems advisable, as in infection, cancer, tumors, etc.

The womb is brought out of the abdomen as in the Sänger operation, and ligated with tubing. A rubber dam is drawn over the womb, to prevent septic matter entering the abdomen, and the child and placenta removed as in the Sänger. The womb is then cut away below the tubing and above pins placed to retain it, leaving peritoneum enough to cover the stump. This stump is cauterized. The old method was to leave the stump in the lower angle of the wound, stitching the peritoneum around it; but the later method is to close

the peritoneum over it and drop back in the abdomen, or remove womb and cervix and close the vagina, turning into that canal all raw surfaces. The close proximity of the bladder must not be lost sight of, nor that organ injured. The instruments required for a Sänger section are simple and at the command of any man. The operation is one that any competent man at abdominal work can do, and the great value of section is the fact that it can be done anywhere and everywhere, when special instruments and technique, as in a symphyseotomy, are not available.

The question of sterilizing the woman by ligation of the tubes, cutting them from the womb and closing the peritoneum over them should be decided before the operation, if possible, and by the woman herself. I should not lightly leave but the one child between the woman and maternity unless she demanded it, but would do largely as she wished, especially if the deformity were not one that would make premature delivery an impossibility. Sänger's great improvement was the suturing of the womb.

The indications for section may be absolute or relative. It is absolute when the true conjugate is less than 6 centimeters (2½ inches), or where blocked by tumors, or for any reason even a dead child could not be otherwise delivered. The relative indications must vary with every case with a conjugate vera of 6 centimeters (2½ inches) to a point when it is born naturally. The only other procedures are version, forceps, symphyseotomy, and craniotomy. Forceps are not comparable, for they are simply aids of weak uterine force. I have expressed myself as to symphyseotomy and craniotomy on the living child, which is not to be considered. Conservative section is the coming operation, and will be done with increased frequency. It will soon be a very poor obstetrician who is not able to do at least this much. I should consider section as reaching from 6 centimeters (2½ inches) to version on the living child and to craniotomy on the dead one. In mild degrees of contracture, premature delivery should be tried and the baby share in the risk. Repeated gestation will result in at least one living child.

Section is best done at term, before the membranes have been ruptured, in a hospital, and with trained help. It is not wise to wait for pains, which may start at any time in the twenty-four hours and force an operation at night; and if the date is reasonably certain, a few days prior to labor is the elective time. Section in placenta prævia is rarely indicated, as it has an even higher mortality and is usually in the presence of a woman weak and anæmic. It would only

be considered in a case of central prævia. Version will usually be the operation of choice. Early, before hæmorrhage, the woman can be safely delivered; later, the anæmia is a bar to section. It is not a routine procedure, but may exceptionally, in special cases, be perfectly justifiable.

In contracted pelvis and prævia the necessary delay may allow of fatal hæmorrhage, and in such case section should be done even in measurements not strictly demanding it. Section is never done except for a viable child and in placenta prævia centralis where the woman will never go to term.

Vaginal section in prævia is all wrong, because here the veins are greatly enlarged from the placenta and hæmorrhage would be frightful.

The dangers of section are sepsis, hæmorrhage, shock (especially if it is a Porro operation), embolism of air.

Voorhees claims its absolute indication is 7 centimeters or less.

Williams would not submit a "pauper patient" to danger of a second section, but would a "woman in the upper walks of life." It is wrong to draw such a line. Infected cases should be treated by a Porro, and if clean by a Sänger.

There is no danger of a rupture of the womb on second pregnancy. There are always some adhesions, but no worse than in fixation. They lengthen out, but may be a real danger for other reasons.

The operation should be done before labor for:—

1. If prolonged, the woman is weak.
2. Atony of womb and less resistance.
3. Effete substances in the blood—auto-infection.
4. Secretions in uterus and vagina may be infected.
5. Head moulded in inlet.
6. Attempts by forceps may have injured the child.

VAGINAL CÆSAREAN SECTION.

In 1896 Dührssen proposed section from the vagina, that route being fashionable then. He opened the anterior *cul-de-sac* and pulled down the womb to prevent bleeding, and split it up in the anterior median line, delivered the child and placenta, and removed the uterus. Up to 1900 he performed it 22 times, but had no imitators. He also made a posterior incision, when room was not sufficient, which opened the peritoneum. A sharp distinction must be made between this and merely cervical incisions. The cervix should never be incised laterally, because of the hæmorrhage met with.

Frisch, of Germany, has made a cross incision from tube to tube, but I cannot find that it was ever done in the United States. The vaginal route is not applicable to every case nor by every operator, and I can see no advantages over the more open and safer abdominal route.

I can see no advantage in the Frisch incision nor in the Dührssen vaginal section, over the abdominal opening. It is certainly much more difficult and dangerous, with no adequate gain. Care must be taken by the operator to place the upper sutures before the child is born, as it would be nearly impossible to do so afterward.

CHAPTER XXIII.

OPERATIVE OBSTETRICS.

PREMATURE ENDING OF PREGNANCY.

ABORTION is the premature delivery of the ovum prior to the attachment of the placenta at the third month—twelve weeks.

Miscarriage is from the twelfth week to the seventh month, or viability of the fœtus. From the seventh month to end of term it is premature delivery. Some writers extend abortion to cover miscarriage, but the placental attachment marks such a change in the clinical picture that the distinction should be made under some name. In the United States the term abortion has a sense of criminality foreign to it. To this the term of criminal abortion, or more often miscarriage, should be used, reserving, if legal, the expression "termination of pregnancy." The ending of miscarriage at the seventh month is arbitrary, as a very few can be saved under that age. Other terms are used, as:—

Complete or incomplete, referring to whether all the products of conception be passed.

Concealed, when the fœtus dies, but is in whole retained.

Inevitable, when the symptoms increase and the fœtus is dead.

Missed, is a concealed with long retention of the fœtus.

Habitual, when there is a history of prior abortions at about the same time.

Criminal, induced or spontaneous, referring to its causation.

In missed abortion the fœtus may be retained a long time, the chorion developing into a uterine mole, or the changes incident to a fœtus retained and mentioned under twins.

Methods of inducing miscarriages are as follows (those starting uterine action directly):—

1. Pelzer's method is to inject glycerine between the membranes and uterine wall. Exosmosis of liquor amnii will cause a shrinkage. It is also an irritant to the muscle, and is usually efficient; but it is apt to be absorbed, and when so it is a poisonous irritant to the kidneys, with hæmoglobinuria and nephritis as a sequel.

2. Scheele's method is to puncture the membranes. There is great danger of pushing the instrument through the soft uterine wall.

This method is very prompt and sure, and often done by women on themselves. The fœtus then acts as a foreign body and is expelled. It should never be done when the child is viable, as a dry labor results.

3. The Farradic current has been used to directly stimulate contraction, but it is uncertain.

4. Injection of water between the membranes is Cohen's method. A few cases of sudden death have occurred.

5. Krause's method is to pass up one or more soft catheters between the membranes and wall. The usual size is a No. 12 French, disinfected and pushed to the fundus. The placental site must be avoided, or a concealed hæmorrhage occurs and the patient will succumb. Several such may be used if, as often happens, one does not start the action, and it is held in place by a tampon. Usually pains start in less than twenty-four hours. It is sure and safe if the membranes be not ruptured and the placental site avoided. These act by dilating the cervix and so start uterine action.

6. Kiwisch's method is the injection of a stream of hot water—106°—against the vaginal vault with some force and for a considerable time. It is very harmless and reasonably sure. The later the more certain it is to act.

Vaginal packs are useless; cervical packs will sometimes act in time. Packing of the lower segment, with considerable separation of membranes, is more efficient, but not always sure.

Rapid dilatation of the cervix by the fingers or instruments and curetting out of all products at one sitting is quick, but attended with considerable shock. It should never be done except under absolute aseptic conditions. Hæmorrhage is severe, but soon checked by hot douches.

The use of Barnes's or Voorhees's bags or the champetier de Ribes is certain, and for premature deliveries a close approximation to nature. There is a risk from sepsis.

For an abortion or early miscarriage the Krause method, if in no hurry, or the immediate dilatation and curettage if speed is required, are the best. For starting premature delivery, the slower the method and the nearer to natural conditions, the better; and here the bags are the best, preceded by the Krause method. In this last condition the muscular force of the fundus is able to dilate the cervix, which is thin and dilatable. The efficiency of the bag is greatly increased by steady or rhythmical tension—eight pounds—on the tube. In miscarriage the liquor amnii is of no consequence, while it means much to conserve it in premature delivery. One is a viola-

tion of natural processes, the other is previous only. In a spontaneous miscarriage the child dies from the separation of the placenta, which is expelled with or soon after the fœtus, or if not, is loose in the womb. When miscarriage is induced the placenta is attached; and after the fœtus passes, it is retained and rarely separates without the use of the curette. It is the placenta that causes the danger, and there can be no safety until it is removed. At the third month the fœtus will pass through a much smaller cervix than the placenta. In abortion the ovum passes usually entire in a clot and often unsuspected, the woman having, as she thinks, a profuse flow after a month's suppression.

Miscarriage may have to be induced, but never without consultation and in the presence of grave danger to the mother. Don't dare to do it alone, with no one to share the responsibility with you. It is overstepping the rule of saving life to take it, and it should be done only to save a more useful being. Some of the conditions that force it upon us are:—

A conjugate vera of less than 8 centimeters (3 inches) unless section is contemplated.

Placenta prævia.

Malignant vomiting and eclampsia, diabetes, goitre, heart disease, aneurism, etc.

Cancer of the womb.

Advanced tuberculosis.

I am not here speaking of induced labor, which is perfectly justifiable in many less serious conditions. There is a great difference between taking the life of the fœtus and having it share in the danger.

Contrary to public opinion, drugs will not cause miscarriage unless given in dangerous doses. The only sure and safe method is a strictly aseptic operation.

Late habitual miscarriage has been successfully treated by 5-grain doses of potassium chlorate t.i.d., with a fair hope of the child being carried to term. No anæmia seems to follow, although the chlorate may be combined with iron with good effect. How or why it acts is not known, nor whether it would be equally effective in abortions. It is also a very good treatment for the endometritis that may be seen prior to such conditions.

Loss of the fœtus is common. Very few women but have lost one or two; 37 per cent. of women under 30 have had this experience. Nature is lavish in efforts to reproduce. From the child at birth back to the ovum is a regular increase of loss. Physiological miscar-

riages to labor are as five to one. The usual time, probably because of some placental disease, seems to be at or near the third month. The causes for miscarriages naturally class themselves into maternal and fœtal.

Under the maternal there is a long list of congestions of all kinds, toxæmias and eruptive diseases, irritability and uterine inflammations, hydræmia of blood, mental or physical shock.

Under fœtal are syphilis, death from blows or lowered vitality, low attachment of the placenta, or an ovum reaching the womb only to find the membrane unfitted for attachment, etc.

The fact that primiparæ rarely abort would seem to show a causal relationship to multiplicity, but we know so little of the inner chemico-histology of reproduction that we can only class some obvious reasons. A peculiarity is the habit of aborting at certain periods of gestation, especially apt to occur after a few induced miscarriages. No matter, then, how ardently the woman may desire children, outraged nature exacts its punishment. It is much more dangerous than labor because of:—

Membranes retained.	Hæmorrhage.
Feeble womb.	Sepsis.
Shock.	

The symptoms vary with the time of gestation, from an excessive menstruation to a full-term labor. At the third month there is a fairly uniform type that must be understood. It has three stages, as in labor. The first is marked by cramping pains, colicky in character, backache, nausea, pallor, prostration, considerable "show," and a peculiar nervous condition, especially if induced, not seen in labor. She feels like "flying to pieces." Considerable weight, heaviness, and congestion are complained of. The "show" is not mucous as in labor, but a passage of clotted blood more or less profuse. The liquor amnii is small in amount and the membrane is ruptured in the beginning, so no gush of fluid marks completion of this stage. The second stage has no mechanism—the fœtus is extruded when the cervix is dilated. The placenta may, in favorable cases, if spontaneous, pass with the fœtus, but usually it does not, and the delicate cord is ruptured, leaving the placenta behind. The first and second stages may last a few hours or days, and are not dangerous. They are prolonged because of the weakness of the womb in muscular strength. There are now some hours of respite, and the woman may even get up, when "flooding" comes on, and very likely until now she has sent for no one.

The placenta is intimately attached to the womb. It has not

"ripened" or been prepared for separation, and so is firmly adherent. The womb at this time has considerable dilating, but very little contracting, function, and there is little diminution in size when the fœtus is expelled. The placental site is no smaller, and the womb does not spring off the placenta as would be the case at term. It separates by partial tears as the womb endeavors to expel it, and the contraction also closes the cervix, both cervix and fundus being nearly of equal strength. The result is a series of "flooding" with each partial separation, and when it does come free it is only to find a cervix that prevents its expulsion, while it holds apart the walls and leaves the open sini to freely bleed. These hæmorrhages are not usually hard to check, but become very exhausting and recur until the uterine action on a cervix relaxed by the anæmia of severe exhaustion allows it to escape. This will take days, and the placenta becomes infected and putrescent. Sepsis is, as a rule, added to the condition.

The condition in the first stage must be diagnosed from menorrhagia, metrorrhagia, and dysmenorrhœa, none of which should present great difficulty with the signs of pregnancy and especially ectopic gestation. In abortion, during a pain the ovum may be felt to bulge as a clot would not, and the normal antiflexion of the womb is lost. The diagnosis of an ectopic must be carefully considered and contrasted.

The mortality of miscarriage is not great in spontaneous cases, because the placenta is detached early, but is very high in the induced. Shock, sepsis, perforations, hæmorrhage, and retention of the placenta cause the great difference. The morbidity has a long train of evils. Sepsis, sterility, endometritis, habitual abortions, anæmia and shock are seen, and few women recover sound health after induced miscarriages. The shock is as great as after a capital operation. The treatment is to put the woman to bed in the dark and quiet. Bromides, chloral, and opiates are needed to insure this. Keep her so until the miscarriage is inevitable; and when this is known, then there is but one treatment, and that is to empty the womb as soon as possible. During the first stage packing the cervix and tampons should be used. I have known the womb to retract from the tampon and squeeze out everything, but this need not be expected. As a rule, the pains cease, and on removal of the tampon the fœtus, but not the placenta, is found.

The woman should be chloroformed, on a table, and the cervix dilated, if not already so, to a point of admitting one or two fingers. The blunt curette should run over the womb and loosen the placenta

entirely, which is then seized and withdrawn as a whole if possible. Do not rest until it is all out. The placental tissue is easily told, from its pale and granular appearance. Bleeding may be free, but is soon checked by hot irrigation. Great care must be used not to perforate the soft uterine wall. This accident has happened in the hands of many competent men.

Involution is rapid, but subsequent endometritis very common. The subsequent treatment is the same as after labor—giving ergot and ten days' rest in bed. No matter how easy and free from hæmorrhage the woman is, if the placenta is retained, go after it at once, for unless you do so hæmorrhage is a certainty. No matter how it is bleeding, get all the placenta when operating, for the surest way of checking the hæmorrhage is to remove the placenta.

CRIMINAL ABORTION.

Criminal abortion is the destruction and removal of the fœtus from the womb, prior to quickening as a rule. It is very common, but how often done the all-seeing eye alone knows; but every hamlet almost, and every city, swarms with professional abortionists. Only persons lost to all moral sense engage in this wholesale murder. They are either too ignorant or lacking in conscientiousness to be aseptic, for secrecy and asepsis don't go together. But the womb will stand much abuse and the effects are not immediately apparent; yet the frequency of the sudden deaths in the offices of these fiends attests both to its prevalence and its dangers. The sequelæ of abortion are:—

Death from shock.	Metro-peritonitis.
Perforation.	Pyæmia.
Air embolism.	Septicæmia.
Endometritis—very common.	Milk leg of veins.
Uterine abscess.	Sapremia.
Endosalpingitis.	Hæmatocele.
Ovarian abscess.	Tetanus—fairly common.
Tubo-ovarian abscess.	

It is a crime seldom mentioned by Protestant ministers, who seem too wrapped up in contemplation of the glories to come to look aside and give the warning advice their congregations need, and who often sin through ignorance. The Catholic Church has and does condemn this practice in no unmeasured terms—all honor to them for it. It is murder in the first degree, with malice aforethought and deliberate intent, worse because of the very helplessness of the victim, and most inhuman of all murders, for the very parent is the aggressor

who should by human and divine law cherish it in its helplessness. Mothers even teach it to their daughters, and in some places the instruments are publicly hawked upon the streets.

It is not always woman's criminality that leads her to this, but her ignorance. There is a common belief that the child is a part of the mother and has no life until a certain age, and the woman can morally do as she pleases with an integral part of herself. This is not true. The child is an individual being from the moment of its conception, and no more a part of the woman than a graft carried to a distant tree is another orchard. It is a parasite on the mother, with no nervous, vascular, or structural connection whatever. The baby at birth is as much dependent on the mother as it was for a considerable period before, and nowhere is there a line dividing it from being a human individual. In fact, it would be more honorable, because showing bravery in assuming a risk, to kill the child after the birth, when a wail of protest, however feeble, might summon help.

Would that mankind could learn that the sexual instinct is only intended for procreation, and that woman's place in nature is to contribute to that end! That it is a noble aim, the universality and strength of sexuality proves. Woman to-day, with her greater suffrage, has forgotten this in her new-found freedom. She is recklessly throwing away work on the lines of her greatest efficiency, and the harvest of sin is death. Onanism, some prevention of conception, and at last abortion, are so common that fully 99 per cent. of families resort to it, as if nature did not know when the woman was fitted for maternity. The laws of the land forbid this crime, but are so emasculated as to be worthless. The moral sense is so low that every newspaper, even religious papers, publish directions as to where it can be done, so thinly disguised that children even know what it means. If some Christian wife dies under a criminal attempt, it is divine providence, and at her bier the minister draws lessons from her noble life, murmurs, "God's will be done"—how the devil must chuckle—and tearfully consigns this premeditated murderess and suicide to consecrated ground. And we of the medical profession seem only able to stem the tide enough to keep from doing it ourselves, and have no breath left for its open condemnation.

The young practitioner especially is liable to be caught innocently by requests to dilate the womb or pass a sound. Be very careful of the sound; pick it up and think twice before you use it. You may be innocent and led into it by design; but she will tell her friends, and some day, when you refuse an open request, you will be told,

"Why, you did it for Mrs. X." If you yield again, you are lost and in the ranks of the outcasts. The very people who think all doctors liars and pride themselves on brains, while buying some old doctor's sure cure for the kidneys, will come to you in guileless (?) innocence and faith for a pill that will bring around a wife at the expense of a human soul.

Repeated attempts at abortion tend to contract the circular fibers of the whole tract and hold the ovum back. This is the great cause of tubal pregnancy, and then the woman who would kill all her children is by retributive vengeance in turn killed. The abortion habit is soon formed, and the woman, perhaps too late repenting, goes to a childless grave, or at labor the more fortunate has a scarred cervix, hard and unyielding, resulting in a tear and possibly permanent invalidism. No wrong goes unavenged. The nemesis of punishment is relentness.

ACCOUCHEMENT FORCÉ.

Accouchement forcé is the rapid dilatation and delivery of the fœtus after the period of viability. It is indicated whenever speed is required and when the slower method by bougies and tampons is contraindicated. It is at best a dangerous procedure, to be preceded by twenty-four hours of softening of the cervix by tampons when possible. With every precaution of asepsis and vaginal douching, and the woman under chloroform, the cervix is caught and dragged down. By steady, gentle force one finger, then two, etc., are pushed into the cervix until it is dilated fully and a foot can be seized and version done. The cervix should be tired out rather than lacerated. It is a procedure for the mother's safety in grave conditions, with the intention to have the child share in the risk. In all rapid and artificial dilatation of the cervix there is a great tendency for contracture; it must, therefore, be fully dilated and the child rapidly extracted. It is not often indicated in true pelvic contraction, or even relative. These conditions being known beforehand, there is no hurry as to delivery, but it holds a place in emergency work. The hand is by all means the best dilator, but is soon tired. Bags are generally too slow and unreliable. Dilators are easy, sure, but dangerous. The mortality to the mother is very small; that of the child depends on its maturity. At six months, with proper care, 20 per cent. live; at seven months 35 per cent. live; at eight months 85 per cent. live. They require all the care spoken of under premature infants. Incubation and feeding are essential. A baby under three months dies, but four to four and one-half months babies do very well.

RETENTION OF A DEAD FŒTUS.

There are several things that may happen if the fœtus be retained:—

1. Before the attachment of the placenta it may be entirely absorbed.

2. By absorption of water it may become mummified and shriveled.

3. It may macerate, the fœtus becoming sodden and pulpified. This never occurs under the fifth month.

4. It may putrify, if germs gain an entrance, usually from rupture of the membranes.

Sooner or later it will cause symptoms. If not septic, the absorption will cause a feeling of languor, loss of appetite, and depressed health. The tongue is coated, skin sallow, with nausea and vomiting. If it become septic, then there will be chills and fever—evidences of septic absorption—and, as the womb will not tolerate its presence, the discharge of fœtid portions of the embryo. Common to this condition at any stage there will be:—

1. No further increase in abdominal size, and the breasts will become flaccid and smaller.

2. All sounds and movements of the fœtus are lost.

3. If the head can be felt, it will be soft and the bones will move under the loosened scalp. If the cord is prolapsed, it is cold and pulseless. Sphincter ani and lips have no tension and meconium is passed.

CHAPTER XXIV.

OPERATIVE OBSTETRICS—EMBRYULCIA.

EMBRYOTOMY.

EMBRYOTOMY is the mutilation and delivery of the child in parts, not possible as a whole. The embracing term is embryulcia, but as some cutting is always necessary, it is included under this general head. Arranged in order of frequency, they are:—

Craniotomy.	Cleidotomy.
Cranioclasm and cephalotripsy.	Amputation of extremities.
Decapitation.	Evisceration.
Perforation of spine.	Spondylotomy.

In spite of the authority of nearly all American writers, I believe, and shall continually urge, that it is not justifiable on the living child. I do this with all charity and kindness, for the following reasons:—

1. It is a choice between section and embryotomy. We will suppose the woman to be exhausted by attempts at forceful delivery, some laceration being a certainty. The case is urgent, and, no matter how much we may condemn a so-called obstetrician who would culpably allow a woman to drift into this condition, one of these must be done. In section the mortality is perhaps 10 per cent. to the mother, and 5 per cent. to the child; and in embryotomy, 8 per cent. to 35 per cent. to the mother and 100 per cent. for the child. Cold-blooded statistics show it is more dangerous to the mother than section. Such a condition could only arise in emergency work, which is equivalent to a suspicion, if not certainty, of sepsis following. It is not wise to risk any more traumatism. Even the Porro, with a mortality of 25 per cent. to 30 per cent., is no more dangerous to the woman and saves the child.

2. The woman who marries does so of her own volition. Maternity and conception are her own act. She is bound, therefore, to share some of the risk, and the child has some rights that deserve respect. Were the child equal in development and viability—a human adult *in esse*, not *in posse*—that right would be equal to the mother's. There is too great a tendency now in the world to abortion, infanticide, and shirking of duties on the woman's part. It has come to a pass when education, equality of sexes, club life, etc., are killing the race,

and the mother is unwilling to even complete the parturient act and nurse her child. Woman is physically, mentally, emotionally, and morally created to perpetuate the species. It is her first great duty, and all else is secondary. If she wants to be other than a mother, then let her give up the crown of maternity, turn from marriage, and wade in the mire as deep as she pleases. If she marries and conceives, she has no right to refuse the responsibility of the result.

3. Except in the hands of an expert, the procedure is more difficult than section. It is not easy to work in the dark and confined space, always less than normal, and not do some damage. Section is clean, every step is in sight, and every source of danger can be guarded against.

4. The instruments for section are few, and every man is familiar with their feel and use. They require no expensive and special instruments not easily or readily procurable.

5. Last, but not least, the law, while making an exception here, is, "Thou shalt not kill." The physician's mission is to save life, not to take it. No harder crisis can confront a man than to be forced to decide to sacrifice one life to save another. The body politic, acting by a jury, may require that the decree of death be passed upon a guilty man, but it is a guilty man and it is for the good of all; not taking an innocent life to save one other only. You can't have too many consultants at such a time. The fact, as Edgar says, that the parents will ask to have the child killed is no excuse. It is a total begging of the question and lowers the surgeon to the plane of a mere hired assassin. It is not their province or right to decide the merits of operations, but to consent fully to your doing what seems best in your judgment, and you can continue in a case honorably on no other basis. I have said nothing of the religious view of the question, but the Catholic Church absolutely forbids it. The laws of the different States allow it, I think without exception. I wish these gentlemen could have heard the eloquent words of Dr. Cole, when he told of his experience, coming early in life, how he walked the floor while this murder was done with his consent, and, falling on his knees, prayed God for forgiveness, promising to devote his life to a condemnation of this operation and to lift up his voice against it. So far as I know, it has never been done by any graduate of the University of California, and I trust it never will be.

It is indicated, then, in the dead child: First, when the normal head cannot be born because of obstruction, that does not narrow the true conjugate to less than 6 centimeters (2½ inches). Second, when

the canal is normal, but the child too large to pass, from hydrocephalus, relative size, faulty position, etc., that cannot be corrected, monstrosities, locked twins, etc.

Embryotomy was known to the Egyptians and is the oldest, perhaps, of all obstetrical operations.

In all cases the woman is to have chloroform, to spare her the details and sight of a mutilated baby, more than to deaden pain. The lithotomy position is assumed and the strictest asepsis observed.

CRANIOTOMY, OR PERFORATION.

The instruments needed are a strong tenaculum for holding the head, a perforator, a bulb-syringe and catheter to wash out the brain, and a cranioclast to crush the skull. Some prefer a special trephine to a perforator. The head is seized and held by an assistant, at the same time forcing it low and holding it through the abdomen. The

Fig. 98.—The Perforator.

operator feels for the fontanelle with the left hand, or a suture if it cannot be reached, and guides the perforator to it, when it is pushed in. The blades should be opened in several directions and go to the base of the brain, cutting up the falc cerebri and falc cerebelli. The catheter is carried into the skull and the brain washed out with the syringe. The next step is to seize the skull and crush it with strong forceps or crochet and draw out. One writer says to be sure to destroy the basal centers, lest when the mutilated mass is born it will try to breathe, etc. What stronger argument for not doing it on a living child? He is willing to do this in the dark, but draws back in horror when he sees the result of such butchery in the light. Before removing the head, any sharp spiculæ of bone are to be pulled out, to prevent laceration of the mother.

Breech cases are always very hard, because the body is in the way. This must be pushed to one side and an opening made where it can be. The brain can be reached:—

1. Through the posterior lateral fontanelle behind the ear.
2. At the lambdoid suture.
3. Through roof of mouth or through chin and mouth into cra-

nium. Decapitation is not a bad method in breech cases. Some advise waiting, after the head is crushed, for natural pains to deliver; but the majority go ahead and clean out the womb, not emptying it too soon, however.

Tarnier and others advise version after craniotomy. Considering that it is always done late in labor, after general uterine contraction and molding to the child, it is very unsafe. There are always an incipient Bandl's ring and danger of rupture, and the bone-fragments

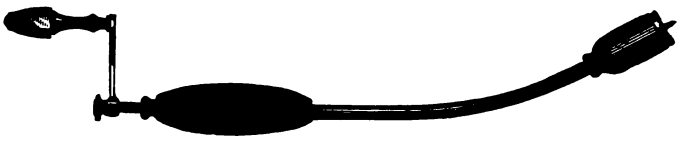


Fig. 99.—Braun's Trephine Perforator.

always present are liable to lacerate the womb in the turning, being pressed out, while the tendency is to press them in when it is removed head first. A laceration of the vagina or cervix is not so dangerous as that of the womb. In hydrocephalus, merely to open the cyst is usually sufficient.

CROCHET.

I want to enter a plea for this instrument, which has been so universally declared obsolete by American writers. I must confess to have shared in this prejudice until I saw it used in Scotland and on the continent in the hands of those accustomed to its use. It is

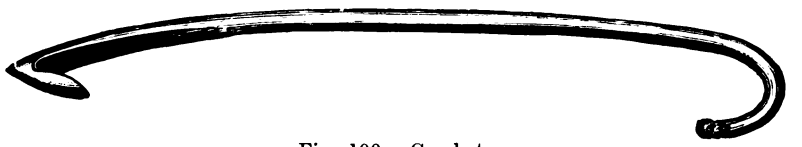


Fig. 100.—Crochet.

simple and easy in application, and reasonably safe when care is taken that it will not slip. It is used very extensively at the Glasgow Maternity, where the high percentage of pelvic deformity and constant, almost daily, use for the craniotomy set entitle them to be considered as authorities.

CRANIOCLASIS.

Cranioclasis is a seizing of the bones of the head by a special instrument constructed like a pair of very strong forceps, one blade (solid) going up through a perforation, while a fenestrated blade is

outside. The preliminary is exactly as in craniotomy—in fact, the two are nearly always done together, cranioclasis being the last step in removing the child. The instrument is applied with the same rules as forceps, aiming to catch a firm grip on the bones, and for this reason the occiput if possible. It is a tractor, not a crusher, of the head. The temptation is always to attempt to rotate the head into position, which is wrong, for the instrument is but modified forceps

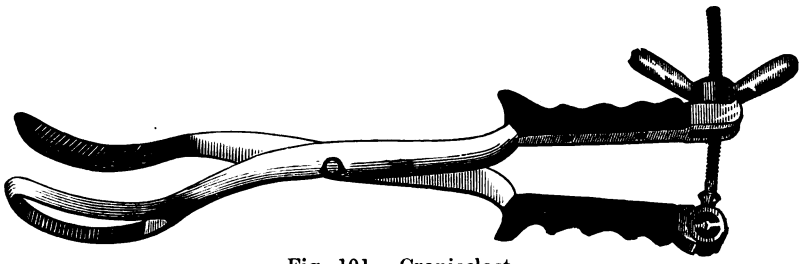


Fig. 101.—Cranioclast.

and subject to the same rules in application, and with a curve that forbids any attempt so to do, without injury.

CEPHALOTRIPSY.

This is nearly the same as cranioclasis, except that a cephalotribe is used and the head is not perforated. It was an invention of Baudelocque, in 1829, to prevent spiculæ that would lacerate. It is a forceps made heavy and thin enough to crush the head and go into a deformed pelvis. It elongates the head, but only by compression in one diameter. It has been practically abandoned in favor of the basiotribe. This latter instrument is a crusher more than a tractor, and if preceded by a perforation not contemplated by the inventor, is good. Cranioclasis and cephalotripsy are much confused unless the original meaning is kept in mind.

BASIOTRIPSY.

This instrument, devised by Tarnier and improved by Auvard, is a very perfect one, unlike the cephalotribe, combining a perforator, cranioclast, and cephalotribe in one. The cranioclast seizes firmly, but crushes poorly; the cephalotribe crushes well, but is a poor tractor; while the basiotribe does both, and in addition the perforator gives a central fixed point, controlling the head while the blades are introduced. When closed, the blades measure 1¾ by 1½ inches.

The perforator is pushed in and bedded fast in the base of the skull. The short blade is then put on and the skull smashed in several places, which is called the "small crushing." The long blade is then put on and the base broken up, *i.e.*, the "great crushing." The closing of the blades greatly elongates the head, and Tarnier has delivered through a 1⅝-inch pelvis. With a room of 6 centimeters (2½ inches) the mortality *per se* is *nil*. Pinaud, in his clinic, had 49 cases with no deaths.

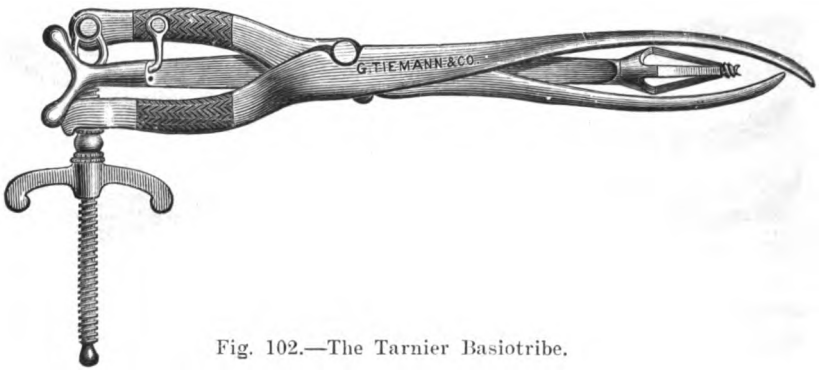


Fig. 102.—The Tarnier Basiotribe.

DECAPITATION.

Decapitation is only used in impacted shoulder cases when version is too dangerous. The baby is here a wedge, and the idea is to bisect the wedge by a vertical incision and extract the body first.

A wire, blunt or sharp hook, or saw is passed over the neck, which is then cut through. Two or three twists of the hook will generally dislocate the neck, which can be cut by scissors. If the sharp hook is used, care must be taken not to cut the mother. The fingers are passed up and around the neck, to steady it while the twisting is done or the bladder might easily be injured by a slip. An assistant should steady the head from above while the body is extracted. The head may be delivered by two fingers in the mouth, aided by pressure from above, or forceps may be put on. A twist from breech to head more easily dislocates the neck than the reverse. Dr. Jardine, of Glasgow, has a sharp hook with an angle rather than a curve, that works nicely. I have had no personal experience with it, but consider it the best of its kind.

PERFORATION OF THE SPINE.

Perforation of the spine is only required in hydrocephalic breech cases. The cord is entered and a sound forced up into the cyst.

CLEIDOTOMY.

This is the cutting of the clavicles, to allow the shoulder girdle to collapse. It is simple, quick, and easy. It should be done in every case when the child is large and any operation has been done to reduce the size of the head. The bisacromal diameter can be reduced from 12 centimeters (4¾ inches) to 8 centimeters (3 inches). A pair of strong scissors is all that is needed. This operation is new in name only, having been the custom of nearly every operator for a generation when he needed room.

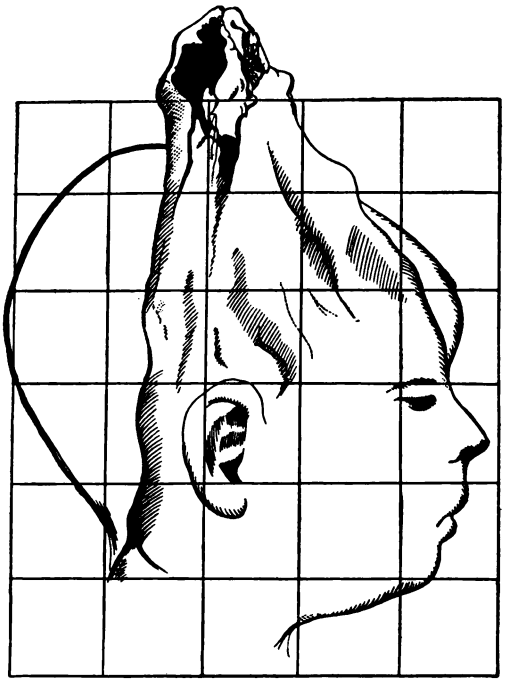


Fig. 103.—Effect of Cranioclasis on the Fœtal Head. (GRANDIN AND JARMAN.)

AMPUTATION OF EXTREMITIES AND EVISCERATION.

This will only be justifiable in monstrosities, to reduce the size of the body or cut off unions of twins, etc. Each case must be its own law. So, too, spondylotomy, or the dividing of the column, will only be required when in the presence of deformity.

In all of these operations the sources of danger are:—

1. Laceration from bone spiculæ.

2. Sepsis.

3. Accidental slips of instruments.

Simple craniotomy may be very easy or it may be very difficult.

We may compare forceps, version, symphyseotomy, craniotomy and cranioclasm, craniotomy and basiotripsy, and section as follows:—

Forceps are to be tried first when the conjugate vera is over 9 centimeters (3½ inches). If a little less than this, deliver by version, since the vertex will elongate. Symphyseotomy is limited between 7½ and 9 centimeters (3 and 3½ inches), is difficult, dangerous, and with unavoidable evil consequences, and I doubt its advisability.

Embryotomy on the living child is never justifiable, and on the dead one is more difficult than section. Section is required in all measurements under 6 centimeters (2½ inches), and has a smaller mortality than embryotomy or symphyseotomy. It will allow you to sterilize the woman if so desired, and prevent future trouble, and leave no after-disability when convalescent. Section is the easiest for a man in country practice, and can be done rapidly in the face of threatened rupture or other emergencies. The mortality is, roughly, as follows:—

	Symphyseotomy	Section	Embryotomy
Mother's mortality.	10.8 per cent.	10 per cent.	8 to 35 per cent.
Child's mortality ..	14.5 "	5 "	100 per cent.
Ease of operation ..	Difficult	Easy	May be hard
After-results	Bad	Good	Good
Future pregnancies	Common	Never if sterilized	Sure to recur
Speed	15 minutes	15 minutes	15 minutes to 2 hours

Forewarned is forearmed. Every case should be measured in time, and notes kept. If this be not done, I only ask you, what may you not find when labor begins?

CHAPTER XXV.

ECTOPIC OR EXTRA-UTERINE PREGNANCY.

ECTOPIC GESTATION.

THIS is a pregnancy outside of the womb, well known to the ancient writers, occurring about once in five thousand pregnancies. Prior to Parry's (of Philadelphia) article in 1876, but little was known of this condition as a surgical emergency. Normal conception occurs in the Fallopian tube, the ovum passing down to the womb by the action of the cilia. It may lodge in any part of its path from the ovary to the womb, because of constrictions or growths in the tube and torsion or adhesions from inflammations, especially gonorrhœa.

First, the ovum may remain at the ovary—5 per cent. Second, the ovum may be forced into the abdomen against the ciliary action —8 per cent. Third, the ovum may remain in the tube—87 per cent.

If it remains in the tube, it will lodge in the fimbriated end, the tube itself, or the uterine end of the tube. Practically, it will be in the abdomen, or develop separating the folds of the broad ligament, in which case it will certainly rupture before the second or third month, into either the abdominal cavity or broad ligament.

In passing, I will say, that combinations of extra- and intra-uterine are termed compound. We can have (*a*) pregnant extra-uterine while having a dead fœtus in utero; or (*b*) ectopic and entopic at once, in which case we can have:—

1. Ectopic preceding the uterine; only three cases have been recorded.

2. Ectopic following intra-uterine—no recorded cases.

3. Coincidentally, of which there are about 100 cases (119 to January, 1904). Before 1893 only 56 were recognized, and since then about the same number.

The danger here is recognizing the pregnancy and considering the ectopic a tube inflammation, or overlooking the uterine. The womb and tube are developed from Müller's duct and are so embryologically alike that the ovum seems fitted to lodge and develop anywhere. If in the tube, it will give three sets of differing results for the three portions. In the fimbriated end it will abort into the cavity; in the tube it will surely rupture in six to eight weeks, or rarely from

the third to eighth month, either into the broad ligament or cavity; in the uterine end it will abort into the womb or rupture.

The etiology is obscure. It occurs in young women of the fertile age—twenty to thirty. There are usually pathological conditions of the tube, of which latent gonorrhœa is the most common, although this is denied. We can readily suppose the cilia weak or destroyed, the lumen blocked and sacculated, and peristalsis weak or wanting. This condition has rendered the womb sterile for some years. Perhaps several induced abortions have happened. Webster considers it a reversion of type, which does not account for its great increase in the last generation.

The pathology of the common tubal type is as follows: The impregnated ovum lodges about the middle third, and, growing, causes a spindle-shaped tumor of the hypertrophied tube, thin in spots. At one thin spot, usually on the posterior wall, it ruptures when of sufficient size. Usually this is at the second month; generally before the placenta is formed, but not until the envelopes of the fœtus are present and the villi embedded in the walls of the tube. In the tube there is no antagonism to the cytolytic action of the villi by the decidual cells, and all grow equally and embed in all directions. There can be no decidua in the tube, but all its walls are in hyperplasia and enter into a placental structure. While a few cases of ovarian ectopic have been seen, it must be remembered that the ovum can only lodge and develop on tissue derived from Müller's duct. Any such case is the result of an included remnant in the ovarian stroma. This tumor may communicate with the womb. The chorion villi are very easily torn, and the resulting hæmorrhage increases the mass and hastens rupture. The examining finger feels a peduncular mass attached to the corner of the womb. Now, this tumor must do something; it cannot grow larger where it is. It will then in rare cases be forced into the abdominal cavity early, not after a few weeks, for then the fimbriæ adhere and close that exit. If this occurs, with the resulting hæmorrhage a pelvic hæmatocele results and the act is called a tubal abortion. This will be impossible after the eighth week. This tumor may rupture inwardly to the uterine cavity, but only when it is lodged in the cornual end of the tube rather than the middle third of the tube. Remaining in the tube to the eighth week, there are only two possible terminations (both ruptures): either to break into the general abdominal cavity through the tube, or into the space between the layers of the broad ligament. Every rupture, no matter in what direction, will give a picture of pain and shock and internal

hæmorrhage. Before rupture there will have been persistent pain on one side for a considerable time.

If the ovum lodges in the cornu, when it reaches a certain size it will rupture into the general cavity or abort into the womb, according as it more or less lies in the uterus. It may either be a dangerous ectopic or an ordinary abortion.

Very rarely it may never reach the tube, but lodges in the ovary. Early rupture is the rule, but in a few known cases the fœtus has gone to term. Usually the tumor is ruptured, the fœtus dies, and a cyst marks the spot, giving but little trouble. As a curiosity, the ovum has become attached to any part of the abdominal wall and gone to term. The most common, as well as the most dangerous, is the

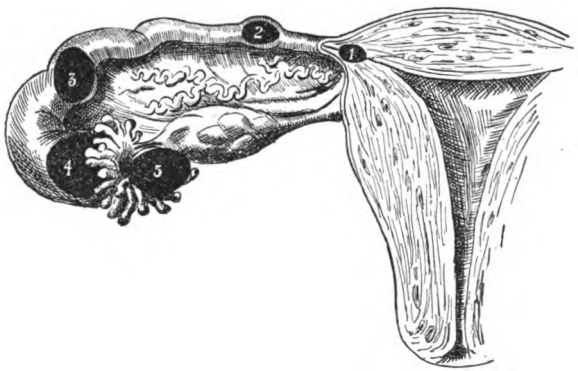


Fig. 104.—Diagram of Ectopic Gestation, Showing Sites of Implantation of Ovum. *1.* **Interstitial Pregnancy.** *2.* **Isthmian Pregnancy.** *3.* **Ampullar Pregnancy. 4. Infundibular Pregnancy.** *5.* **Tubo-ovarian Pregnancy. (GILLIAM.)**

tubal. Nothing shows the parasitism of the fœtus better than these facts, *i.e.*, that it will grow anywhere in the body until killed by rupture or pressure, and the womb is but a protecting and expulsive agent.

These cases are usually first seen by the general practitioner, and then by the surgeon. Diagnosis is very important.

A ruptured tube is a surgical emergency the moment it is recognized, and no expectant plan is justified. Death to the mother is the rule, if let alone, in 76 per cent. of cases. The mass ruptures about the third month—eight to twelve weeks. In one-fourth of the cases this occurs into the sigmoid, one-twentieth into the vagina or bladder, but the vast majority of them into the abdomen. The child is

a dead one in any event. If the woman lives, it will be encysted or absorbed, and at the ninth month there will be a false labor with pain and casting off of decidua.

The symptoms of ectopic gestation are those of a normal pregnancy somewhat altered.

1. Usually some years of sterility, but regular menstruation, followed by symptoms of pregnancy.

2. The morning sickness is unusually severe and the areolæ of the breasts more marked than usual.

3. There is a history of one or two missed periods in a woman who has been regular, but with irregular discharge of blood, which is scanty and dark-colored and which begins two weeks after a missed period.

4. Some shreddy decidua may have passed at irregular intervals and the woman suspects an abortion.

5. There is pain in the pelvis; a boring, griping colic as the tube wall gives away, and an agonizing colic when it ruptures; but unless some blood is lost internally, there will be none of this. It is often limited to one side and she feels faint. Shock will follow and she will be pale, cold, pulseless, and may die, or she may rally. She will go through with this again if she lives.

6. The womb is enlarged and displaced to the opposite side. It is not as large as it should be for the time of gestation. It is also softer and the os is like a pregnancy.

7. To one side or behind the womb is a cystic, symmetrical, fusiform, very tender tumor, or an ill-defined mass. It often pulsates. For the first two months it is the size of an olive, becoming the size of an egg at the third month.

8. There is no colostrum in the breasts.

9. The sound shows the womb to be empty.

10. The vaginal pulse and color are the same as in pregnancy. Such a condition calls for operation at once, for a rupture is the only outcome. There is no saving of the child; even if in the abdomen, it will be deformed, and the mother's welfare is the sole care. This is best conserved by operating before the rupture.

The presumptive signs are:—

1. Symptoms of pregnancy after years of sterility, and extra nausea.

2. Irregular show of blood in a woman usually regular, with cramping pain in the pelvis. This combination of persistent cramp and show after suppression and supposed pregnancy is almost diagnostic.

The probable signs are:—

1. Displaced womb and pulsating cyst, very tender, having a steady growth.

2. A patulous os and soft, empty womb, as if pregnant.

The positive signs are:—

1. Traces of decidua with the above history.

2. Colic pains followed by faintness, either marking a local tearing or the symptoms of rupture, hæmorrhage, shock, and collapse.

The condition is hard to diagnose, because at this early stage pregnancy is not easily determined. A case showing suppression of menses, bloody, irregular, decidua discharge, and colicky abdominal pains is one demanding instant exploration. It is too often true that women do not consult their physicians until a rupture occurs, mistaking it for an abortion. Symptoms of rupture differ a little, whether it be into the abdomen or broad ligament.

Symptoms of rupture into the abdomen:—

1. A woman previously in good health is suddenly taken with agonizing pain, faints, and her pulse and temperature become subnormal. She gets whiter and whiter, ears ringing, and air-hunger. These are symptoms of hæmorrhage somewhere.

2. The abdomen becomes full, tender, and tympanitic.

3. The respiration becomes shallow and sighing.

4. If the woman lives, peritonitis is the result.

Rupture is a sudden surgical emergency, demanding instant operation or the woman will bleed to death. There is no time to stimulate, which will only increase the hæmorrhage. Shock and her faintness are an effort of nature to stop the bleeding.

Symptoms of rupture into the ligaments:—

1. As before, sudden pain and faintness, which pass off for a few hours or days, to recur again. It is a slower hæmorrhage, held in by the broad ligament and new inflammatory tissue.

2. On one side of womb is a round, symmetrical tumor, very tender, and becoming larger after each painful attack. It is oftentimes in the *cul-de-sac*.

3. A growing anæmia, and sense of weight and pressure on the rectum. The pelvis is blocked and the gut distended with gas.

These two must be kept distinct. In the first, operation must be done at once; in this last, a day or two of delay may be taken, to transport the woman to a hospital or prepare her for operation. Rupture is often caused by tight lacing, jolts, coitus, and defecation.

The treatment is to operate upon diagnosis and before rupture,

if possible. The vaginal route should never be taken. The abdomen only offers a clear field and opportunity to ligate the vessels accurately. The arteries should be clamped and tied as soon as the abdomen is opened. If the placenta cannot all be removed, it should be drained. There is great danger of sepsis if it is left behind. All clots should be removed. The operative procedure is a matter of gynæcological interest and does not come under the title of obstetrics.

CHAPTER XXVI.

PATHOLOGY OF PREGNANCY—TOXÆMIAS.

TOXÆMIA OF PREGNANCY.

THESE have their origin in a state of autointoxication, accompanied, if not caused, by a functional incapacity and disintegration of the liver. The liver is, in every advanced toxæmia, the site of degenerative changes apparently identical with acute yellow atrophy. The beginning is probably hepatic insufficiency to more than excrete, or rather prepare for excretion, the nitrogenous waste of the mother, and which, when the fœtal metabolism is added, is found entirely incapable of this function. There is then left a surplus of unknown nitrogenous waste in the blood, which gives rise to very profound symptoms and degenerations. It is a severe, necrosing poison of animal nature.

The symptoms of this toxic poison or poisons are not identical, but give rise to several types of disease: hyperemesis, puerperal neuritis, eclampsia and psychosis of gestation, and probably also many minor conditions, as skin eruptions, etc. There are only two conditions, especially, under which this poisoning is to be considered, lest we theorize beyond the present known facts—the toxæmic vomiting and eclampsia. These shade into each other from normal nausea to acute toxæmic vomiting, but had better be kept apart with our present knowledge.

PERNICIOUS VOMITING.

Pernicious vomiting is not the nausea normally occurring in the first month of pregnancy, which is usually in the morning and disappears with the lifting up of the womb out of the pelvis. Vomiting in pregnancy has been divided into three types: reflex, neurotic, and toxic. The term vomiting is a misnomer; nausea is the better. Physiological nausea is seen in nearly every case, but vomiting with any regularity is rare and to be considered pathological. The neurotic type can only exist as a mental impression. There should be a distinction made here that is rarely drawn, and I am inclined more and more to consider vomiting as a mild toxæmia, especially if frequent, rather than to class it as one of the normal phenomena of gestation. Vomiting is the result of irritation, either locally at the stomach or

centric from irritation in the cord. The first is accompanied in the adult by retching, the last by almost a regurgitation. I am inclined to consider every case of vomiting after the fourth month as one of toxæmia, and also every case before that time if regurgitant and repeated. This vomiting is centric and could not arise from irritation of the stomach, but is a direct impression on the center in the brain, from the circulating poison. The condition begins insidiously and is soon associated with changes in the liver, shown by jaundice, clay-colored fæces, and toxæmia. Thierfelder, in 83 cases of yellow atrophy, found that 30 were pregnant.

The post-mortem changes are identical with those of acute yellow atrophy and need not be described. The kidneys usually show a cloudy swelling, evidently a secondary result, due to the improper condition of the poison for excretion. This condition of the kidneys is shown by albuminuria, casts, and hæmoglobinuria. The kidney changes are the result of time and severity, and are therefore seen late in mild cases; and death may be so sudden as not to have seriously altered them. The kidneys are in nowise the cause of the trouble. Ninety per cent. of pregnant women have a trace of albumin, which has no bearing on this disease.

In toxæmia, the vomiting by the third month is generally so bad that the woman goes to bed; by the fourth month it is severe and continuous, and food-retention almost nothing. The vomit is dark and blood-stained; patient restless; odor of acetone on the breath; visual changes; slight jaundice; pulse small and weak, but with no temperature; urine is scanty, of high specific gravity, albuminous, and contains less urea; leucin and tyrosin, with casts, are present, and æsophageal pain. There may be no jaundice, because the liver is too disintegrated to produce bile. The majority of cases are in primiparæ.

Gueniot gives the mortality without abortion, 90 per cent.; with spontaneous abortion, 35 per cent.; with induced abortion, 52 per cent. Hirst gives 30.7 per cent. mortality in all cases. This is higher than in eclampsia, no doubt, because of the earlier appearance of the toxæmia.

Coffee-ground vomit is especially a dangerous sign.

All attempts to connect this poison with the placenta have proven *nil.*

Dienst, in eclampsia, has shown that the blood of the mother agglutinated and dissolved the red cells of the child, and concluded that a pervious placenta might act as a cause. Hexner has seen in the

eclamptic liver thrombi or hyaline emboli, apparently the same as if caused by an hæmolytic agent. It is perhaps safe, without endorsing Dienst, to say that the toxin of this condition has an agglutinative action that causes at least a part of the liver changes.

Other theories advanced have been secretion of corpus luteum of ovary, absorption from gut, hepato-toxæmia, invasion of mother by syncytial toxins, acute yellow atrophy, and toxins from the intestine. (Stone, Ewing, Edgar.) These last gentlemen think all toxæmias of pregnancy and atrophy are the same. But I think we can only say that it is a poison of metabolic origin, giving vomiting first, then liver, and lastly kidney changes. The albumin shows only just before death. The nitrogen excreted as ammonia, compared to the total nitrogen of the urine, is increased from the normal 3 to 5 per cent. up to 16 to 32 or 46 per cent. This may be due to loss of liver substance and its inability to convert it into urea, or it may be efforts to neutralize an excessive production of acid. The necrosis of the kidneys is in appearance like that of a corrosive acid action. Such an ammonia increase is equivalent to a very serious toxæmia, and 10 per cent. has been suggested as a point demanding abortion. In reflex and neurotic vomiting there is no such increase. Disintegration of the blood should be a sign for abortion. Vomiting occurring late in pregnancy is most often toxæmia.

Vomiting in toxæmia has no relation to the food taken. She is restless and has mental symptoms, somnolence, coma, and death. The nervous symptoms are marked. Rapid pulse is ominous. Mania is very apt to mean coma.

ECLAMPSIA.

Eclampsia is a toxæmia of pregnancy characterized by headache, epigastric distress, changes in vision, and ending in convulsions. It occurs almost always in primiparæ. Hirst says it is more common in those illegitimately pregnant, which might be expected from their naturally more nervous and emotional mental condition. The anæmic, gouty, rheumatic, and neurotic, from their lessened ability to excrete, are more susceptible; and for the same reason it occurs more frequently in wet, cold weather. It is more often seen in multiple than single births. Hospital statistics show a higher percentage of eclamptics to normal for two reasons: the earlier and more accurate recognition of the trouble, and the greater proportion of unmarried women that apply for entrance.

As to frequency, Parvin places it as 1 to 333; Löhlein, in Ger-

man hospitals, 1 to 160; Champetier, in France, 1 to 354; Schrieber, in Vienna, 1 to 311; and even more frequently in the United States. In any case it is within the limits of a real danger, sure to be met with sooner or later by every general practitioner.

Zweifel has termed it the "disease of theories." Its exact etiology is unknown, but from the mass of accumulated knowledge enough has been learned to give rational lines of treatment.

Some of the theories at times predominating are of interest, each having an element of truth and all leading up to the modern conception of the rational treatment.

First, in 1839 Rayer showed the association of kidney disease with pregnancy; and in 1843 Lever proved the presence of albumin in eclampsia, and that many cases acted like the terminal history of Bright's disease. From this, the old school of the time of Meggs believed it to be due to pressure on both the ureters and the sympathetic filaments, inhibiting their action. They saw it more frequently in first labors, twins, hydramnios, etc., and late in pregnancy. Against this is the fact that the disease is not helped by the reduction of womb size in the last month, the albumin being worse then; that there is no venous stasis, that the ureters are not pressed upon, nor will albumin follow tumors or other large womb masses.

Second, that the kidney was not able to excrete the waste product of both mother and child, and it was a retention of urea in the body. Against this is the fact that urea will not cause eclampsia. Again, in 28 fatal cases Shauta found the kidneys normal in three cases; and Prutz, in an exhaustive study, found in eclampsia only a fatty degeneration, not an inflammation, which was secondary in 94 per cent. of cases. From this it was, however, learned that albumin was a worthless test, and that urea excretion more closely approximated the disease. In fact, Ingerslow reported 112 cases with no albumin; Schroeder, 62; and Champetier 143. Little, of Johns Hopkins, has also shown the reverse to be true, that in 967 cases of pregnancy albumin was present about half the time. A small amount is, therefore, almost physiological.

Third, due to poisons evolved in the placenta. It was based on the fact that death of the child usually ended the trouble, and also the known eroding, digestive action of the syncytial cells on the womb wall. Veit and Scholton championed this. This was abandoned when Ascoli and Weighard injected placenta into the blood without producing symptoms, while eclamptic blood would do so; and Liekmann, injecting placenta into the peritoneal cavity, could

only at times set up a transient albuminuria. It was also shown that when elimination was perfect, relatively large quantities of eclamptic blood were inert. The placenta is therefore not the cause; but it pointed clearly to the need of a perfect excretory function to get rid of the toxin. It was suggested that the syncytium had its neutralizing antitoxin at first, which later was itself not neutralized, and that this was the peculiar poison. (Veit.) This was disproven later.

Fourth, autoinfection from failure to excrete creatin or other poisonous leucomains. It was considered closely allied to the condition arising from potassium salts and nitrogenous food, lack of bile, intestinal putrefaction, and the toxins of tissue change. There is no increase of indican, which would be present in coprostasis. While it is true that constipation, uterine size, hydramnios, rich food, and lack of excretion all favor it, it does not prove that this is the cause, for the urea is lessened in amount, not increased, in eclampsia. It ignores the child as a factor; yet if the child dies, the woman, as a rule, gets well, and the best treatment is to empty the womb at once, when it has been shown by Trantheroth that albumin will usually cease or greatly decrease. Nor will the supposition that in a second pregnancy the woman has acquired an immunity account for the freedom of eclampsia in multiparæ.

Fifth, thyroid inefficiency. It was noticed that the thyroid is enlarged during pregnancy, that it had an action on metabolism and influenced excretion. Nicholson, of Edinburgh, in one case kept the woman until labor by its use, while six days afterward she had an attack; prompt use of thyroid prevented any more. This only showed that thyroid helped elimination, and Lange, in 133 women, found no enlargement in 25, of whom 10 were eclamptic.

To sift out the truth and sum it up, we may say that the child and its membranes are not the cause either by its size or weight; nor by its sex, position, or presentation, except as it bears on a condition starting in the mother. There are several cases where eclampsia came on with a dead child; T. M. Allen mentions two incidents and Ewing two, and it is certain that with the death of the child all substances injected or in the fœtus fail to reach the mother. In one case it followed a hydatid mole. (Hitschman.) And while degenerations are found in the mother, none are commonly found in the child. When it dies, as it will in every severe case, that is a result and not inherent. The relief of its death or delivery is not the stopping of the cause, but favorably influences the disease, and it can only do so by no longer adding its excretion to that of the mother.

It is not the result of kidney disease, since Boudin has shown that a woman may die of uræmia and have no symptoms of eclampsia. The poison must come from one of three sources:—

1. Faulty maternal metabolism.

2. Poison generated at the placenta.

3. Poison of the fœtus passing through the placenta to the mother.

Albumin alone in the urine is not a test. Albumin and nervous symptoms are very suggestive, and if with these there is lessened urea, eclampsia is a certainty. Urea is not the cause, nor is its absence the cause; but lessened urea shows a lessened change in the preparatory metabolism of dead tissue. One reason for error is that leucin, tyrosin, and allied forms are unoxidized proteid bodies that are included in the urea test. It is probable that they represent more than urea alone in the problem.

It is a fascinating idea that the woman with eclampsia has a kidney function just sufficient for herself, and not enough for herself and the baby. I can find no statistics showing the after-history of these cases, whether a large number succumb to kidney disease or not. On what part the two factors play of lessened power and increased amount to excrete, I can find nothing directly.

Late work shows that the freezing point of the blood remains the same before and after convulsions, but its toxicity varies. In general, it is three times as toxic as usual just before, which is exactly the reverse of the urine. From this it would seem that the poison is not a solid, but is in the blood, and that the convulsion favors its elimination into the urine.

Bouchard and Tarnier have done excellent work on the toxicity of the urine. The latter has found the urine not extra toxic during the convulsion, but that it becomes so rapidly immediately after. This would seem to indicate that the convulsion was a conservative effort to get rid of the poison, and that the convulsion did not so much force the blood through the kidney as prepare it for rapid excretion elsewhere.

From all this we may conclude that it is a fairly well defined poison; that there is either excess of it, or a lessened power to get rid of it; and that it is on the line of the urinary excretion, and we are forced to merely define it as a retention of kidney excretion, giving a toxæmia with well-defined nervous symptoms.

The blood-pressure in the kidney is regulated by the nervous system with reference to excretion. The damaged kidney of Bright's

has a high blood-pressure behind it, to make up for the loss of excreting surface. In eclampsia there is usually a high blood-pressure, and also a rapid pulse. This is probably due more to the irritation and retention, than to the distribution of kidney substance. Rapidity of pulse is not a good thing for the excretion of solids. The American treatment, by veratrum viridi, favors the excretion of solids by slowing the rate and giving time for excretion through the plexus. How far it works beneficially by ending the symptoms due to high pressure on the brain is hard to tell; but while it holds in check the convulsions, it can have no favorable bearing on excretion. It is of benefit in the acute attack, but is worthless in proportion to the time over which it is to be used. For this purpose nitroglycerine is far superior.

Up to the present time at least four cases have died from toxæmia without exhibiting the tonic and clonic convulsions. This probably means that the poison may select in one woman her vomiting center, in another the cerebral motor center, and in a third the degeneration of the liver cells. This is in keeping with what we might expect and clinically see in every toxæmia. Now, while the excretion is by the kidney, it by no means follows that the fault lies in that organ, for the kidney function is only to excrete certain substances formed for that purpose, and its elaboration is in the majority of cases in the liver cells, from there to the blood. Upon post-mortem the organs are found healthy, except, perhaps, the secondary changes of the kidney and a slightly fatty heart and liver. In this latter is found what we might suspect—a decided degeneration. The work of Schmorl proves that in 15 per cent. of all cases dying the liver was found decidedly at fault. That it is not found oftener than 15 per cent. is not against the liver origin, for in a disease that only begins about the seventh month of pregnancy and must end at the latest within two months, we could not expect to find profound degenerative changes. Ewing, of Cornell, working up the pathology, considers the liver the only organ uniformly at fault. Here there is evidence of functional disturbance. It is in a state of "fatty degeneration, as if from a corrosive poison."

The symptoms begin insidiously, not suddenly, as some seem to think. There is usually the triad of headache, nausea, even to sudden amaurosis, which will not be permanent, and failure of vision. Nausea returning at about the time it should be over, is suspicious. Backache is common, and the eyelids and ankles are apt to be puffed a little. This œdema is local and erratic—it comes and goes. The

tongue is often coated, bowels sluggish, irregular heart, loss of appetite, and change in disposition. Dizziness is often complained of. The nausea is often preceded by a "goneness" or "emptyness." Following some days or weeks of this there will be a period of twitching of the face and eyelids, until a convulsion comes on. This may be mild or severe, and is only the beginning, as they will certainly recur with increasing severity and frequency. A typical convulsion begins with prodromes—almost an aura—of headache, roaring in the ears, or dizziness, nightmare, double vision, or blindness, or by more nervous symptoms of epigastric distress, pain, and vomiting. The pupils are either contracted or dilated, but changeless. The convulsion is exactly like that of epilepsy, tonic and clonic spasms, episthotonos, and coma. The tonic last a variable time, the coma following in a few (five to ten) minutes. Rarely this may last for days. One convulsion may kill the baby, and repeated ones surely will; and they recur until the womb is empty. Yet I had one case lasting over a week, with over three hundred fits, go to a perfect recovery and have subsequent children without trouble. The convulsion is sudden, but is always preceded by symptoms for days and weeks if carefully watched for.

As Dr. D. H. Stewart has pointed out, it is a picture of overstimulation of the arterial system. "The blood-quantity is increased at the expense, and its quality lowered to a point that the poisons are not handled by the liver." It is, as he says, a "plethero-toxæmia."

Before every convulsion a close watch of the urine will show the failure of excretion, and an albumin increase if it be present. The average daily output of urea for the female is 450 grains, perhaps in pregnancy a little less. When it is below 300 it is a danger sign. Tests for urea are rather complicated until rendered familiar by practice. (Doremus and Upjohn.) A test for toxæmia of the blood would be the most certain, but takes too long and is impracticable. Again I want to urge the watching of the urea as a guide to the elimination, not the albumin; for Gerster has reported 108 cases of eclampsia with no trace of albumin, and albumin occurs in 4 to 7 per cent. of all pregnancies, and is almost physiological and causes no trouble alone.

As stated, the poison is, or is closely associated with, a nitrogenous failure of excretion. The most accurate test is for the amido acids and ammonia, *i.e.*, unoxygenated urea. These ammonia products will run 3 to 5 per cent. in normal cases; 10 per cent. is a danger point, and 30 to 40 per cent. has been seen. So, too, the

presence of etherial sulphates in the urine, and indoxyl and skatoxyl sulphates in the fæces, means eclampsia; but it is the work of days for an expert chemist in a well-equipped laboratory to make a quantitative analysis for these substances, and at present they are of academic interest only.

Being a failure of excretion, it is worse in the cold and damp months of the year. Especially fatal will be those cases in which the prodromes have been overlooked and the first symptom is a convulsion coming on postpartum.

The urea falls before a convulsion, and rises after. The muscular strain and high pressure act in increasing excretion, either through the kidneys, or by using it up in the exercise of the spasm, or thereby producing a neutralizer.

In eclamptics the pulse is quick, hard, and wiry, the blood is hydræmic, the arterial tension high. The convulsion is due to cerebral anæmia. It is this high blood-pressure that sets up the kidney changes and albuminuria, instead of being the cause. Often prior to the convulsion there is an exhilaration and feeling of well-being that is marked and leads directly up to the spasm. It has been shown that the brain of an eclamptic woman is more susceptible to toxins than before, and this accounts for the sure repetition of the trouble.

A familiarity with this disease leads me to notice two types. First, the usual one, of which we have spoken when, after prodromes of some weeks, the woman drifts into eclampsia. It is probable that this woman may later be a subject of Bright's disease. Second, a type having but few and illy defined prodromes, showing itself, late in pregnancy or soon after, by a sharp, severe convulsion. This latter is only found in primiparæ, and may persist some days after delivery.

Very nearly the same thing has been noticed by Von Leyden, who has divided it into a true nephritis, showing pathologically an acute parenchymatous change and exudate (Schwangerschafts nephritis), and a kidney of pregnancy—a large, pale organ, showing degenerative changes, as if the result of some corrosive agent (Schwangerschafts niere). The post-mortem findings are in some cases identical with acute yellow atrophy. There are, first, small necroses at the periphery of the lobule; second, necroses in sector form that cut into the lobule; third, deposits of fibrin which accompanies the necrosis; fourth, thrombosis of intra- and inter-lobular portal-vein branches. There are later thrombi of lungs, and brain with hæmorrhage and softening. The kidney degeneration is of its epithelium—a secondary change wholly, as is also any parenchymatous degenera-

tion of the heart muscle. Such extensive thrombosis can only come from a circulating fibrin ferment-like substance.

From the foregoing you can easily see that a pregnant woman should be under the care of an able physician, especially in her last months, and that he should regularly and systematically examine her urine for urea at least, and still better if the NH_3 output is watched. I know of no disease where it is more important to be forewarned.

If it is of the first type, you are to put her to bed absolutely, under a competent nurse, who will follow your instructions with tact and firmness. The effort is now to save the child, if you can, until viable. The patient is to have one or two hot packs per day, to favor the skin action and conserve the kidneys. She is to drink all the water possible. Her diet is to be milk and nothing else. Large, high enemas are to be given at least twice daily, of normal saline solution, and retained if possible. Purgation is kept up by compound licorice or jalap powder, with occasionally calomel or salts.

While skin action is wanted, don't use pilocarpine, as it is a heart depressant. If the pulse is very high, bleeding is good; but nitroglycerine reduces this and acts well. Calomel and soda seem to help the liver and should be used, also croton oil. It is essential to cut off all nitrogenous food. The trouble is a toxin. By these means you are forcing elimination by skin, intestines, and kidneys to the top notch, and lowering the waste to the lowest point. In a diet of milk alone, I have more faith than in any drug. Veratrum viridi does not eliminate, and, while time-honored, has no curative effects. Like chloroform, it will control the spasm in large doses, but is unsafe to use in this slow but progressive type, the treatment of which is to last for weeks. Lastly, be prepared on short notice to forcibly dilate the os and deliver the child, should decreasing urea show danger, or convulsions come on, increasing in frequency and severity.

If this treatment fails, and in the second type, you are to give veratrum viridi and chloroform. Here the child is not to be consulted, and the treatment is to empty the womb as soon as safety permits. Either forceps or version is to be done, whichever is quicker. With this sudden emptying also lies the danger of secondary hæmorrhage.

When it can be done, forced delivery should be preceded by thirty-six hours' packing of the cervix.

Some years ago, on the theory of pressure being the cause, it was suggested to dilate the cervix, especially in persistent vomiting. The results were poor and it is no longer recognized. Naturally, if

the child is dead a rupture of the membranes relieves pressure, starts labor, and may be justified. Many cases of the first class respond to treatment and give time to get a viable baby, but the majority will not go to term. Nearly every case will require active termination of pregnancy. So well understood is this that the best men advise disregarding the baby in every case, and empty the womb at any time when eclampsia is recognized. It is only fair to say that the trend of opinion is to this conclusion; but I feel that they are a little too radical, and believe a trial treatment as stated will not jeopardize the mother and will save some children. It is also difficult to gain the woman's consent to a radical procedure at once, when, after a few weeks of bed treatment, under the constant menace of the thought, feeling its need, too, with the increase of her other symptoms, she will then feel that a trial was made and the fight lost, and will submit to your decision. You will have gained her admiration for your prophetic knowledge, and her belief in your conservatism will not be shocked. Nothing seems to win a patient to an operation like thinking about it. They soon get into a frame of mind of "well, here goes." Another argument in favor of a prompt radical interference is the danger of sepsis, both from the operative procedure and especially from the weakened resistance of the patient. An average statement of the risk is 40 per cent. mortality for the mother and 70 per cent. for the children; yet many desperate cases will recover, and many mild cases will die, which is another reason for not delaying induction of labor.

In those cases that seem purely of kidney origin, the results achieved by the Edebohl operation of decapsulization of the kidney have led to a trial of it in eclampsia. In the one case he reports convulsions began before labor and lasted until two days after, when the kidney was stripped. They at once stopped and the woman recovered. It is not yet a recognized procedure.

In a few cases, also, section has been done, to more rapidly empty the womb. Where a pelvis is contracted, and after death, if circumstances favored it, the procedure cannot be condemned.

Again, M. T. Helm, British Medical Journal, May 14, 1904, relates a bad case in which 6 grams of cerebrospinal fluid was withdrawn by puncture. Only two light attacks followed, and a rapid recovery was made. This relieved brain-pressure, but is likewise merely a curiosity of treatment.

To sum up, it is a toxæmia of the maternal urinary excretory system, always giving prodromes, of which frontal headache is the

most constant. And with our present meagre knowledge we can sum up our treatment in the lines of lessening the excreta, favoring excretion, reducing heart action, and, lastly, induction of labor.

When we are face to face with the convulsions, we must first control them and then empty the womb. Chloroform cannot be used long, morphine deepens the coma; chloral is the best, in large doses. The so-called American treatment, by veratrum viridi, of Parvin, 1896, is fair only. Bleeding, especially with a full pulse, when blood can be safely taken, is good. This is one of the many good things I have learned from Dr. Robt. A. McLean. The infusion of saline solution is especially of value, and the best formula is to add one ounce of sodium acetate to each pint of saline solution, according to the plan of Jardine, of Glasgow.

CHAPTER XXVII.

PATHOLOGY OF THE PUERPERIUM.

SEPSIS.

CHILDBED fever, or sepsis, has been described since the dawn of medicine, but its etiology was guess work until 1843, when Oliver Wendell Holmes showed its contagiousness, followed by Semmelweiss, of Vienna, and James Y. Simpson, who proved the danger of examining a woman with dirty hands. To the disgrace of medicine, this was entirely ignored, even ridiculed. Semmelweiss died insane from the abuse he received, asserting to the last that post-mortems were followed by childbed fever.

In America at that time Hodge and Meggs controlled all obstetrical thought, and, while at outs personally, united in bitterly opposing any such idea, and drew from Holmes a monograph closing with these words: "No tongue can tell the heart-breaking calamity they have caused; they have closed the eyes just opening upon a world of love and happiness; they have bowed the strength of manhood into the dust; they have cast the helplessness of infancy into the stranger's arms, or bequeathed it, with less cruelty, the death of its dying parent. . . . The woman about to become a mother, or with her new-born babe upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden or stretches her aching limbs. The very outcast of the streets has pity upon her sister in degradation, when the seal of promised maternity is impressed upon her. The remorseless vengeance of the law . . . is arrested in its fall at a word which reveals her transient claim for mercy. The solemn prayer of the liturgy singles out her sorrow from the multiplied trials of life, to plead for her in her hour of peril. God forbid that any member of the profession to which she trusts her life, doubly precious at that eventful period, should hazard it negligently, unadvisedly or selfishly."

And with all this, systematic asepsis was only established October 1, 1883, in the New York Maternity Hospital, under Garrigues.

More than sixty years have passed since the days of Holmes, Lister has revolutionized surgery, Pasteur has methodized our knowledge, and yet the frightful mortality of puerperal sepsis continues,

and 70 per cent. of all deaths in confinement and one woman in every hundred die of it. At one time almost every case confined in a hospital died; to-day, 14 per cent. will show rise of temperature, and the mortality is 1 per cent. or a little less. It is too often overlooked. Between the ages of 25 and 35, at the most vigorous period of her life, one woman in every six who dies does so because of septicæmia. Even to-day the causes, symptoms, and treatment—the whole subject, in fact—is obscure in medical minds; conflicting statements are still made, and the truth is yet hard to find.

The puerperal womb is an ideal culture-bed for germs. There are here poor circulation, heat, moisture, blood-serum, and neurotic tissue, air and darkness, to favor incubation, in a patient exsanguinated and depleted to a point of offering but little resistance. Here, also, are increased blood-vessels and lymphatics in a now useless and retrograding organ, with a cavity filled with detritus and ooze. Clots plug the ends of the vessels, and the placental site is a wide area of raw surface, with warmth and moisture. Germs multiply rapidly in such a place. This ideal culture-bed, if infected by pyogenic germs, will give you sepsis, which is nothing but a wound infection. These germs always come from without. It is never the result of colon bacilli, gonococci, etc., but they are present because they are allowed to get on the vulva, nay, more often actually carried up and deposited on the womb by the examining finger, for the external os marks the line of any germ life in a normal case, no matter how profuse the saprophites may be growing in the vagina.

Prophylaxis is of especial value in sepsis; treatment is symptomatic. Labor is an example of what may be considered a capital operation, aseptic and subcutaneous. Since the researches of Döderlein, in 1893, which proved the aseptic condition and antiseptic secretion of the vagina, it only remains to see that no septic material gets in from without. All sheets, towels, and clothing must be sterile; inflammations of the genital tract must be cured before labor, coitus interdicted, and the woman built up in health to resist any invasion. Especially must free intestinal elimination be induced, for sepsis is the result of toxins absorbed, and it needs but those added from a coprostasis to be overwhelming. Your nurse must be trained in aseptic rules, for the physician is at the mercy of his nurse. The most virulent case I ever had came from the nurse not using pads, but scraps from the rag-bag. At the advent of labor a bath should be given, preferably a douche of the body, for Edgar has called attention to the danger, in a tub bath, of floating epithelial cells onto

and into the vulva. This is especially so where the water is hard. The vulva hair should be clipped and the parts scrubbed with lysol. An enema should be given, so that during labor the bowels will not move and soil by contact or gas emanations. The rectum is always septic and is in dangerous proximity to the field concerned.

The germs get to the womb by dirty hands and nails, by dirty bedding and cloths on the vulva, or by wiping up over the anus into the vagina. No man should ever take a confinement for a week after a case where he has dabbled in septic pus. I want also to caution you to get hold of the family syringe used for general utility purposes. The now-abandoned use of a douche after labor has about drifted down to the country midwife, and is a most dangerous procedure. The same nozzle used in the husband's rectum may be thrust into the vagina. It is possible that the air may be contaminated, if the plumbing is poor and the old stationary washstand is in the room. I need not caution you to have every instrument boiled and to use rubber gloves. A chain is no stronger than its weakest link. You may use gallons of bichloride and be absolutely aseptic for a time, but then forget yourself and handle some septic article and, without resterilization, go on with your work, and you have undone it all. Sepsis more often comes from the nurse than the doctor. There is no safety except the cultivation of that absolute aseptic mentality that leads you to disinfect unconsciously after touching a dangerous thing. Again, men who would not think of amputating a toe in a home, will use any old room and untrained help for obstetrical manœuvres, and wonder at the infection that follows. Our fearful mortality will never be lower until the parturient vagina is entered with as much careful attention to asepsis as the abdominal cavity. It really needs more.

The predisposing causes are:—

1. The whole act itself, the retained blood, bruised and damaged tissue, weakened and exhausted patient.

2. Perineal tears.

3. The virulence of the germ.

4. Retained secundines. Here it must be kept in mind that retained membranes rarely cause any trouble, but that any fragments of placenta left behind will almost surely do so.

5. A placenta prævia or low implantation, both from its nearness to the cervix, and especially because it is in the lower segment and not in the firm, hard, strangulating grip of the muscular fundus.

6. Shock from hard labor and loss of blood, anæmia, or bad hygienic surroundings.

7. Primiparæ, who are more subject to tears.

8. Large heads, male children, etc., causing abrasions and lacerations, and lastly, in many cases we can't find the cause and in our ignorance we call it autoinfection or blame a gonorrhœal infection or old pyosalpinx.

The germs are of two classes: septic and saprophitic. The septic germs are the streptococcus albus especially, and the staphylococcus aureus; occasionally the colon bacillus, malignant œdema, and gonococcus; very rarely the Klebs-Loeffler, typhoid, pneumococcus, and tetanus bacilli. Practically, it is always the streptococci mixed with the staphylococci.

Saprophytes are local, live on dead tissue, and give a sapræmia or intoxication. The septic family produce toxins and toxæmia, live and invade well tissue when virulent, or act as saprophytes when attenuated. It is important to remember that the septic germ has this double action. Now, septic fever exists under three types that shade into each other, are always blended, and are named from their predominating symptoms. It is rare indeed for one type alone to be present, but we must divide them for clearness, and keep them in mind.

A. A putrid fever from ptomaine absorption. It is a true surgical fever, which comes early, raises temperature one degree, is transient, and soon disappears. It means nothing.

B. A sapræmia, which means a local septic wound with presence of saprophytic germs. This alone is never fatal, but it blends and shades into

C. A true toxæmia or septicæmia. This is a general infection of the whole body by the deadly streptococcus albus and staphylococcus aureus, which, if not fatal, is sure to leave some permanent injury behind.

The streptococci, upon entering the womb, penetrate the decidua and endometrium to the lymph channels under the peritoneum. From there they go to the venous sini and lymphatics of the pelvis, and to the body generally. I want to emphasize that when they cause symptoms they are already so deep in the wall that no curettage can remove them. A few years ago the curette was used freely, and 22 per cent. died. With our present knowledge it is criminal to curette, which opens up a new source of infection and cannot remove the cause. This does not apply to sepsis after abortion, where the womb

is open because of the retained and adherent placenta, which must be removed. After labor the condition is absolutely different.

Let me impress upon you that every rise of temperature above 100.5° is to be explained and watched. A temperature of 100.5° within one hour postpartum is very common (97 per cent.), but not after the first shock. Don't be misled by any old nurse's idea of milk-fever on the third day. There is no fever when the milk comes in, and nine times out of ten such a fever is a mild sepsis. I am sorry to say that this old idea still lingers and is even taught; but then "What damned error but some somber brow will bless it and approve it with a text, hiding the grossness with fair ornament." A temperature of 100.4°, then, may not be sepsis; but if the patient does not feel well, it surely is.

Here are the causes that may give a rise of temperature in the puerperium:—

1. A surgical fever, lasting a few hours or a day, to one degree, say.

2. A fever of exhaustion or hunger that ends with the first sleep or taking of food.

3. Influenza and infectious diseases.

4. Malarial chill and fever, which is rare even when the woman has a run of chills and fever. Nor will it "light up a malarial infection," with due respect to Hirst and others.

5. After great hæmorrhage there may be a rise of temperature and rapid pulse until the blood is replaced.

6. A transient fever, spoken of by M. Callignon, resembling malaria, caused by uric acid in the urine.

7. Constipation and reflex irritation, which is very common and needs careful diagnosis from mild and beginning sepsis.

8. Septic fever.

The symptoms of sepsis rarely show before the third day, and never after the fifth. The third and fourth days seem to be the critical time. For a few days, then, the case is a normal one. Fever is the first sign of trouble, rising to 100.5° or over. This fever may be preceded by chill or coldness, or it may be absent; one-third will show no well-marked chill. With this may be a headache, malaise, or sleeplessness; one thing is sure, she feels sick. The pulse is always rapid, quick, hard, and running, perhaps not regular. It is out of proportion to the fever, and this is very important to remember. A temperature of 98.6° equals a pulse of 78; 100.4° equals a pulse of 88; 102.2° equals 97; 104° equals 105; 105° equals 109, etc.; but

here we see the pulse 100 to 130, with a temperature under 103.° It is of more diagnostic value than the temperature. Exactly the same applies to the pulse here as in appendicitis. A rapid pulse and respiration with a low temperature is a sign of sepsis. The tongue is coated, breath bad, appetite is lost, and great thirst present. There is often constipation, later changing to septic diarrhœa. Nausea and vomiting are frequent.

The womb is usually relaxed and may be tender, which shows the peritoneum to be invaded; and with this involvement of the peritoneum there will be thirst, constipation, tympanites, peritonitis, though occasionally the belly may not be tympanitic even when full of pus.

The lochia is almost always suppressed in streptococci infection, and this is an early symptom; it will have a peculiar, sweet, mawkish smell in pure sepsis, or be purulent and fœtid in saprophytic cases, and of a dirty brown color. The sooner after labor it begins, the more virulent the case. The vulva is inflamed and œdematous, with a pseudo-diphtheritic membrane on the walls. This is the mark of a very virulent type, from which few recover.

As the disease progresses, a rash may be seen on the skin; but itchiness and icterus are common, the heart muscle becomes degenerated, the kidneys fail, and albumin is present in the urine.

Examination of the blood for the germ is valueless, but the vaginal discharge may help. It is well to consider every fever of 100.5° septic until proven otherwise, and be guided by the pulse rather than the temperature.

In general, pure sapræmia has a high temperature, slower pulse, foul odor, lesions of womb or vagina, and the womb is filled with *débris*. In septicæmia the odor is sweetish, and foul only late; the temperature is not so high, while the pulse is rapid; lesions are not apparent, and the womb interior is smooth.

Regarding the chain of lymphatics affected, it is well to remember that the lymphatics of the labia, nymphæ, and clitoris run to the upper chain of inguinal glands; the perineum and lower vagina to the superficial inguinal; the middle vagina to lowest internal iliac; the upper vagina and cervix to the internal iliac and sacral; the lower uterine segment to the sacral, and from them to the iliac and lumbar; the fundus and body to the lumbar glands by the broad ligament. The lymphatics of the womb are deep in its substance, and form a network under the peritoneum.

The placental site is usually the point of invasion, and the glands lie too deep to be felt or removed.

Keeping in mind that sepsis is an entity more or less mixed with sapræmia, it is well to consider its actions under the head of the particular parts or structures upon which its action seems spent. The following is from the classification of Edgar:—

1. Puerperal septic vulvitis and vaginitis.
2. Endometritis { Septic. Putrid. Mixed.
3. Metritis.
4. Salpingitis.
5. Oöpharitis.
6. Acute septic lymphatica.
7. Septic phlebitis { Uterine and para-uterine. Metastatic pyæmia. Pneumonia. Endocarditis. Arteritis. Phlegmasia alba dolens.
8. Cellulitis.
9. Pelvic peritonitis and perimetritis.
10. General septic peritonitis.
11. Urethritis, cystitis, pyelitis.
12. Septic proctitis.
13. Mastitis.
14. Septic erythema.
15. Pemphigus.
16. Tetanus.
17. Neuritis.
18. Auto-infection.
19. Gonorrhœa.

1. This is nearly pure sapræmia. The vulva is inflamed, catarrhal or ulcerative, or covered by a pseudo-diphtheritic membrane, which may go on to phlegmon and gangrene. The fever is one of absorption. It is the least dangerous of all, easy to diagnose, and the inguinal glands are enlarged and tender.

2. Endometritis is the most common form at the placental site. It is septic and putrid, and may extend over the whole internal surface. In pure sepsis the discharge has little odor. A zone of inflammatory tissue walls off the infected area, which a curette would

destroy if used. There is a fever (102° to 103°) often preceded by a chill, a very rapid pulse (120 to 130), coated tongue, thirst, loss of appetite, nausea, and vomiting. The womb is tender, enlarged, and doughy, lochia scant and frothy. When it is mostly sapræmia, there is *débris* to wash out and no further treatment is needed. In septic endometritis, a mixed type is quite the rule and is local and superficial. It is rarely wholly so, but shades into the third type of metritis easily, and almost inevitably will there be patches deeper than the lining of the womb.

3. Metritis, or inflammation of the uterine wall, is always preceded by the last-mentioned type. The germs involve the wall by three routes: lymphatics, direct continuity, and veins. When they spread along the lymphatics, they are sure to go clear through to the subperitoneal plexus, where, if they fortunately stop, an abscess is very liable to occur, with its adhesions. A great part of the wall may even slough away. Deformity and after-consequences are sure to be present. The symptoms are marked by peritonitis and great tenderness of the womb. It is very severe and dangerous, and the logical outcome of number 2. When of phlebitic origin, there is danger throughout the whole body. The mildest form is where it is a deepening of number 2 by continuity invading the wall. Here a line of new inflammatory tissue, in part at least, successfully walls it from further extension, and holds back the toxin from an overwhelming discharge into the general system. This is perhaps the most common type of puerperal sepsis.

4. The tubes are more liable to become septic by continuity from type 1. The superficial inflammation may be overlooked and the attention is drawn to a persistent purulent salpingitis. This is a rare type. The streptococcus is particularly a boring germ, seeking, by preference, to go through the wall rather than extend by an upward superficial inflammation.

5. This is the same as the above, the ovary only being matted in the inflammatory mass.

6. Acute septicæmia lymphatica, or general invasion of the body by absorption of the lymphatics and a delivery of the same into the blood-stream. It is the most virulent type of all, and death may occur before the local changes are marked. The serous surfaces are affected everywhere—pleura, synovia, and peritoneum. It begins with a chill, followed by a high fever (104° to 106°), a rapid pulse of 130, wiry and irregular. The skin is green or yellow, face drawn, there are sleeplessness, coma and delirium, vomiting of bile-stained mucus, and

thirst. The jaundiced skin is very itchy, the urine scanty or suppressed, and the secretion of milk stops, as does the lochia. The bowels are at once constipated, or, if the patient lives, a septic diarrhœa supervenes. The peritonitis is general and tympanitis extreme. Death is almost certain. Fortunately, it is rare since the aseptic treatment, but fifty years ago it was the much-dreaded "peritonitis" after labor.

7. Septic phlebitis is the same poison, only expended mainly upon the veins. The placental sini are therefore the site of absorption. Thrombosis and infarcts result. The effects of this type show so widely in the body and so far from the source of infection that they must be taken up under their own heads, but at the same time the fact of their common origin and etiology is to be kept firm hold of.

(*a*) Septic uterine phlebitis is the septic infection of the normal thrombosis occurring after labor. Instead of their normal absorption, they are walled by a zone of new tissue, while the thrombus breaks down into an abscess. They are generally but a late manifestation of some other type of sepsis. As a rule, they are not met with before the first week; more commonly, the tenth to fifteenth day. This only means that we recognize it then in the course of the infection. We have the course of the disease modified by the pus absorption. There is a slow rise of temperature, or a chill and rise of temperature. The course is much like malaria, each fever ending by a profuse sweat. The womb is large and tender, and perhaps nodular. When the abscess is close to the peritoneum, adhesions occur; and should the abscess discharge by the womb, a hæmorrhage from the open veins will either destroy the patient at once or leave her too exhausted to rally.

(*b*) A metastatic pyæmia is caused by emboli lodging and causing infarcts, which start a new abscess. With each of these there will be a new chill, fever and sweat, besides the symptoms of the circulatory changes. The lungs are particularly vulnerable. The skin is jaundiced, urine scanty and albuminous. At the best there is a long, slow recovery, with many relapses; or the patient may die suddenly within a few hours, from the infarction of vital circulation.

(*c*) A septic pneumonia from infection must be treated as a pneumonia, and is a very serious complication.

(*d*) Phlegmasia alba dolens, or "milk-leg," is a thrombosis or cellulitis occluding the femoral vein. A thrombosis is more common than a cellulitis. The femoral vein is inflamed at Poupart's ligament,

and the lumen is occluded by a clot. It occurs about the time of the patient's "getting up," *i.e.*, the tenth day. At this point in the vein the current is slow. The left leg is usually at fault, supposedly from the loaded rectum that so regularly precedes it. The tongue is coated for this reason. The first symptom is a heaviness or stiffness of the leg, with tenderness along the vein, which soon is reddened and traceable by the eye. Swelling follows, beginning at the ankle, until the whole leg is hard as marble, not even to be pitted, white in color, and much enlarged. It is becoming very rare for two reasons: our better ideas of sepsis and the longer rest in bed we now enforce. I have never seen a case that was not attended by a midwife and left her bed within a few days after labor. Such a woman has a mild sepsis that would have been overlooked, her vitality being sufficient to handle the toxin formed until added to it was the too-early getting up, when mechanically the thrombus formed. The treatment is absolute rest in bed, with elevation and bandaging of the leg. Time and the results of collateral circulation will effect a cure, but the woman will always suffer pain and weakness in that leg.

(*e*) Ulcerative endocarditis may result from the circulating toxin here as in many diseases, and require its distinctive treatment.

(*f*) Arteritis as the above may be a resultant sequela.

8. Pelvic cellulitis is the septic inflammation of the peri-uterine cellular tissue. In this case the germ has gone through the lymphatics to this point, and there caused the changes locally. It is a peculiarity of the whole subject of sepsis, that the germ can pass through tissues that seem able to resist it, or at least are little affected by it, and lodge at some further spot, there to expend their energy. It seems as if wherever the germ stopped it was dangerous, and not so when moving. This cellulitis may be absorbed, or go on to pus formation. This infection is of a low virulence compared to metritis, for example. It is too mild to kill outright until it reaches this less resistant tissue. It seems particularly to follow septic wounds of cervix or vaginal vault. It is not ushered in by the marked symptoms of uterine sepsis, but is localized. At one side of the pelvis there will be marked tenderness and a boggy, ill-defined mass of inflammatory tissue. It is very frequently absorbed in part at least, leaving a deformed, drawn-over womb, bound down by adhesions. If it goes on to pus, the chills and fever and sweats appear.

9. Pelvic peritonitis is the result of the toxin being carried by the lymphatics through the womb to the peri-uterine peritoneum. In this type the inflammation is not severe enough to involve the whole

surface. Pus is very rare and, if present, is encysted. It is the result of metritis, which is always present, but in this case the perimetritic element predominates the symtomatology. The knees will be drawn up, tympanites is present, there is often fluctuation in Douglas's pouch from effusion. In a cellulitis the mass felt is to one side; in this case it is posterior. Cellulitis is close to the womb, but not so integral a part of it. The prognosis, if no further extension occurs, is good. It is a cardinal rule in all sepsis that the more localized the lesion, the milder; the more diffuse and general, the more fatal. It is only local because of the inherent resistance of the body; when it is general it shows a lack of vitality or a virulence of the germ that is fatal.

10. A septic general peritonitis is the most virulent form of sepsis. There is a continued extension of the inflammation by contiguity, unchecked by the body. It is secondary to metritis and perimetritis. It is invariably fatal. In all these types of sepsis there are also two modes for the spread of the infection: by lymph and tissues in contiguity, and by veins and lymphatics to a general infection. The one is stayed by wall after wall of leucocytes that rise up to die—a pathological Thermopylæ—but which delays the invasion and gives precious time for the body to react; in the other, there is none of this, but the body is killed as by a dose of poison.

11. The urinary system may be involved, ascending from the urethra to kidney, and give cellulitis and pus anywhere along the tract.

12. Proctitis and mastitis (13) are local.

14. Erythema and pemphigus (15) are local lesions of the skin at the point of toxin elimination.

16. Tetanus may be added to the septicæmia.

17. A paralysis or neuritis is a late sequela, perhaps from the action of the toxin analogous to diphtheritic paralysis.

19. Gonorrhœal infection is always superficial, and not mixed with other germs. The abrasions of labor favor its contraction.

These are types of the disease merely as they affect different tissues and patients. They are rarely or never seen singly, but exist in all mixtures. I caution you to read these types as a whole, not as entities, and to remember that it is one poison, gaining entrance in one way and therefore having but one line of treatment.

Treatment.—Were this a toxæmia wholly, the treatment would be a general one; or were it a pure septicæmia, we would treat it locally. Since it is always a mixture, our treatment must consider both phases of the disease and be both general and local.

Locally, we are to shave the genitals as for an operation, and

examine the whole tract with a speculum, in a good light. All necrotic tissue is gently removed and the abrasions cauterized with pure carbolic acid and alcohol. The curette is a dangerous instrument in the womb, but we can safely use it and irrigate once to remove all *débris* and as far as possible superficially cauterize the womb with a carbolic wash. The point to bear in mind is to disturb as little as possible the protective zone that is already limiting the spread of infection. Unless there is hæmorrhage, it is unwise to pack the womb or vagina, though I have used and do use after the initial douche a light pack of 5 per cent. iodoform gauze wet with formalin solution. This is removed in twelve hours and not renewed. Twice daily until well I give a hot, carbolized vaginal douche myself—no nurse is to be entrusted with so delicate a proceeding—with the utmost gentleness, to wash out all *débris*. A glass double-flow is good, but I prefer the plain rubber pipe without tip, passed on my finger. A douche of glycerine and alcohol in water is very good because of its draining or osmotic effect, and it acts perhaps better in septic than sapræmic cases. It is especially valuable in endometritis where the germs have not penetrated deeply and can be washed out by the osmotic flow. Where there is much dead tissue, good results can be had by hydrogen peroxide occasionally, but not regularly. I should be afraid to use it too soon after labor, for fear of its opening up the clotted sinuses and promoting hæmorrhage.

The use of bichloride of mercury or any mercurial salt is to be absolutely condemned. It has little penetrating power and coagulates albumin. It will leave the womb surface sealed with such a coagulation, and prevents drainage. It is as if a septic wound were closed by collodion, under which the process only extends the more. The general treatment has three main objects:—

A. To remove the toxins.

B. Support the patient.

C. Control some of the symptoms.

These are important in the order named.

A. Every avenue of excretion is to be worked to its highest efficiency. (1) Open the bowels by calomel and salts and large saline enemas. Flush the colon every three hours with the same. The bowels are apt to be paralyzed, especially in the peritonitic types, and it is especially necessary to give large and repeated doses of the salts. The intestines excrete a good deal, perhaps the bulk, of the poison, and they must be kept open.

(2) Hypodermoclysis, once or twice a day if the pulse is 120,

is good. This replaces the water drained from bowels and kidneys, and supports the heart. In severe cases there is sure to be nausea and vomiting, and the stomach will not tolerate the water required by the system.

(3) In cases of vomiting of dark, green, bilious, evil-smelling fluid, stop everything by the mouth and lavage the stomach. While uncomfortable in its use, the stomach-tube will work wonders in abating this symptom.

(4) Contract the womb with large doses of ergot, or, if the stomach is weak, give ergotine hypodermically. This contracts the womb and mechanically prevents absorption and spread of the toxin by veins or lymphatics.

(5) There is but one drug that seems to stimulate elimination and may perhaps in part neutralize the toxin, and that is iodine. There is no other treatment to compare with its full use, and you are to iodize the patient just as quickly as you can. This is the rational use for iodoform gauze in the first pack. Some of it will be absorbed. Rub the body with glycerine and iodine. Give two grains of iodoform in capsules every hour until you get a constant, steady reaction in the urine.

(6) In 1903 Dr. C. C. Barrows announced the use of formalin, 1 to 5000, injected into the veins. It has not proven successful, and I mention it only to condemn its use.

(7) The inunction of Credè's ointment, the citrate of silver, is very good, acting exactly as does iodine, than which I consider it no better. It could properly replace inunction with iodine and glycerine.

B. Treatment of the patient.—(1) She is to be supported by whiskey, quinine, and what easily-digested food her stomach will tolerate. Quinine should be given in three-grain doses every four hours. Strychnine will be useful for the weakness and to support her heart in nearly every case, but its usefulness comes late, with the exhaustion. Quinine acts better in the early stages.

(2) In peritonitic cases an ice coil to the abdomen should be used, to reduce the fever and inhibit the inflammatory changes.

(3) The use of serum alone has a mortality of 33 per cent., as against 4 per cent. by the eliminative treatment. The use of antidiphtheritic serum for a streptococcic disease is unscientific in the extreme, and its uselessness is clinically proven; but in the case of the Marmoric or streptococcic serum itself the case is far different. When it is a pure streptococcus invasion it is good, theoretically and clinically. The trouble is that the infection never is pure, and may not be

streptococcic at all. There is no way of telling this but by a culture, which is very hard to obtain, requiring much technical skill and time to make the test. By the time it can be cultured the case is too old for the best action of the serum, and it is questionable whether we then gain by its use. Again, we might get a staphylococcus culture from the womb, showing few if any streptococci, and yet deep in the wall were the streptococci nicely hidden and producing all the toxæmia from which the patient was suffering. I am loth to condemn what appeals to one as a true and rational treatment of this disease. I have used the serum and never failed to get a profound impression, shown by a rise of fever and a drop, but I could not see that it materially shortened or modified the course of the malady. I do not care to go on record as condemning it, but my personal experience teaches me not to depend upon it in the slightest degree. To be effective, it must be used very early in large doses, and this at present is before a certain diagnosis can be made of the active pathologic germ. Nor do I think that a drug which will produce such a great result when given is harmless and free from danger if it be not needed. It is certainly a detriment to use it if the streptococci are not the active germs; how great, we cannot tell. Few men have cases enough, or opportunity, to try a series with and without its use, of about the same type, and in numbers sufficient to form an accurate criterion to go by. I dismiss the subject with the feeling that it is not yet cleared up so that rules for its use can be laid down.

(4) The use of antipyretics, especially the coal tar series, is to be absolutely condemned. This fever is a conservative process, altering the toxins into forms that can be eliminated. It is one of nature's ways of effecting a cure, and should not be combated until it is of itself endangering life from too rapid tissue changes. When this happens there are other ways, and better ones, of lowering the temperature. This whole group are heart-depressants, and all toxins are hard on the heart, as shown by the endocarditis present occasionally. The heart muscles must be conserved. It is over-working as it is, and usually requires strychnine before the end. To further weaken it, merely to reduce the fever from one arbitrary thermometer mark to another, is to invite death. The lower the temperature in a case of sepsis, the more dangerous the case. A patient with low temperature and high pulse, or who is sick but feels well, is very apt to die. A case showing 104° is more likely to recover than one of 102°, mainly because of the alteration in the delicate chemical composition of the toxin by the heat. The action of the water with which you are to flood the patient,

producing sweating and skin action, is sufficient to reduce the fever; or if not, cold sponging will surely prevent too high a rise. And again, I want to insist upon not yielding to the temptation to use the curette.

C. Now some special conditions may require treatment beyond those incident to each type. There is often an intense itching of the skin. This can be allayed by alcohol rubs and cold applications usually, or, if not, by morphine. The use of morphine, too, is often required to control the restlessness and almost delirium of the woman. If it produces a calm, quiet mentality, it greatly favors recovery and saves the patient's strength.

The whole summing up is to eliminate the toxins. When first seen the cat is out of the bag. What we have left is to prevent any more toxins forming if we can, and get rid of what we already have. Under this line of treatment 95 per cent. will recover if taken in time, and the time element is of the utmost importance. The body is all but overwhelmed by the poison—every hour of treatment at the beginning is precious beyond price. Every case when first noted should have, no matter how mild, the same radical treatment we would give to the most virulent type. Never give up treatment or hope. The most desperate cases sometimes suddenly turn to recovery, and some of the mildest will die. Fight the poison day and night. Most of the cases die from exhaustion after days of struggle. Be guarded in your prognosis.

In spite of all, at a moment, some complication may arise, such as perimetritis, adhesions, and pus. A septic embolus may break into the ovarian or iliac vein, and the infarct may set up a fatal pneumonia, nephritis, or endocarditis. A purulent peritonitis or abscesses in any part of the body may occur and should be promptly opened. Every case suddenly becoming worse must be again overhauled, to see what has caused the exacerbation.

In serious cases the womb has been removed, but I cannot see any reason for this. It might do in a few, very few, selected cases. The trouble is not a local one, as I have mentioned again and again deliberately, because of its importance; it is a general poisoning of the body that kills, and the poison is general before we have diagnosed the disease. It is general, from the initial chill or shock to the patient. It is then too late to remove the cause. Local disinfection will prevent much, if any more toxin absorption, as well as a hysterectomy, and the patient is in no condition to stand such an operation. Operative procedure is limited to opening abscesses and, in perimetritis, the *cul-de-sac* and packing with iodoform gauze. When the pulse is run-

ning 130, weak and thready, it is no time to remove a womb. In general, it is best to avoid all surgery possible. Cases apparently mild I have found so nicely balanced that the shock and strain of even a mild procedure was too much for the resistant powers. Hysterectomy can never cure the woman, for the germ is surely in vessels or lymphatics far beyond the local infection.

Excision of thrombotic veins has been done, but with very indifferent results. The actual cautery and burning of the uterine cavity by steam have of late had advocates. It destroys the cavity and organ, fails to reach the germs, and is not curative. The surgical treatment of sepsis offers few particular problems. Pus is to be evacuated, and regard for a weakened patient maintained.

Every case must be treated on its own lines. You must literally live at her house day and night until the case is over, and I need not caution you to give up obstetrical practice during and for a week or two after such a case.

And all of this can be avoided by perfect asepsis during and for a few days after the labor.

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